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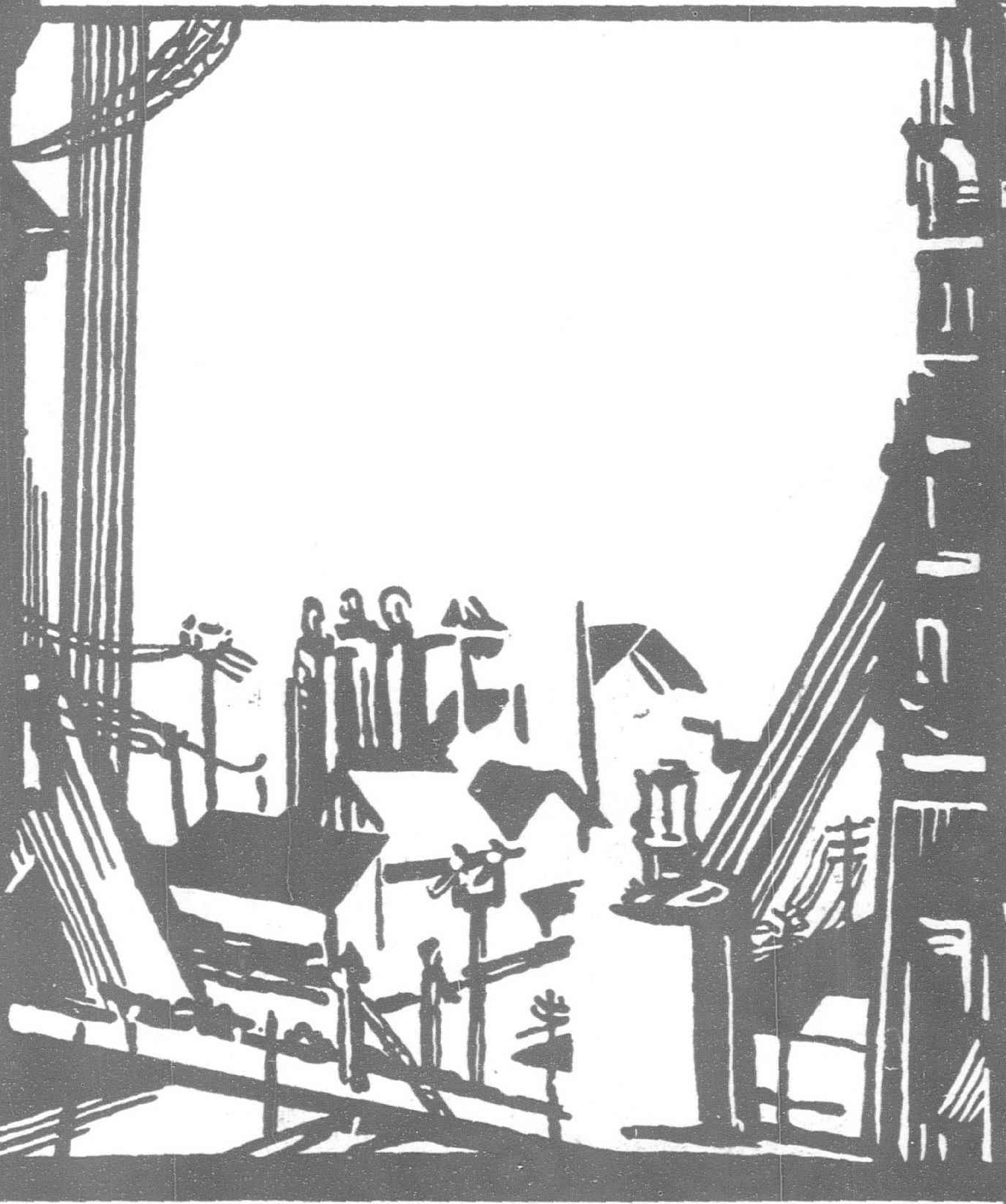

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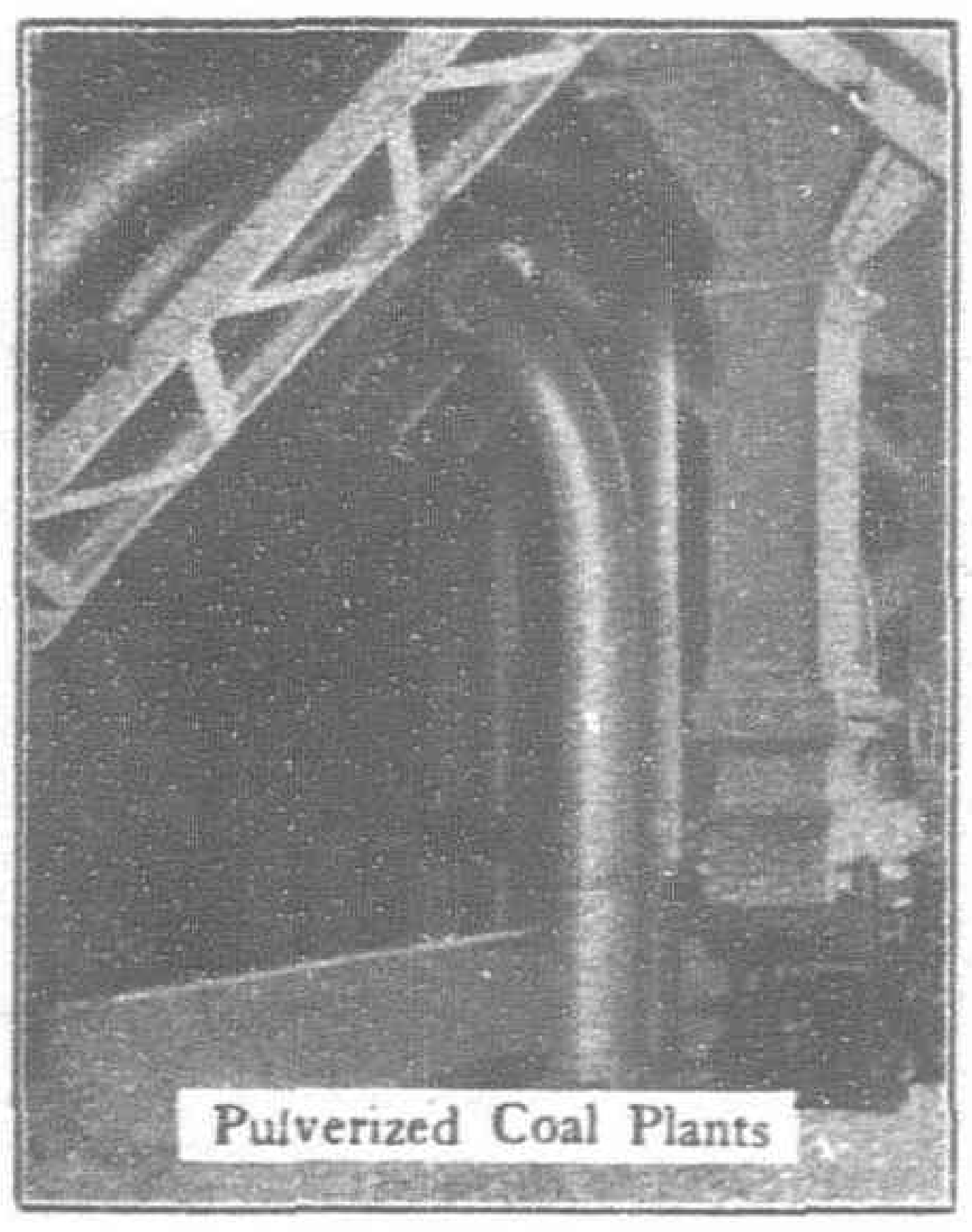
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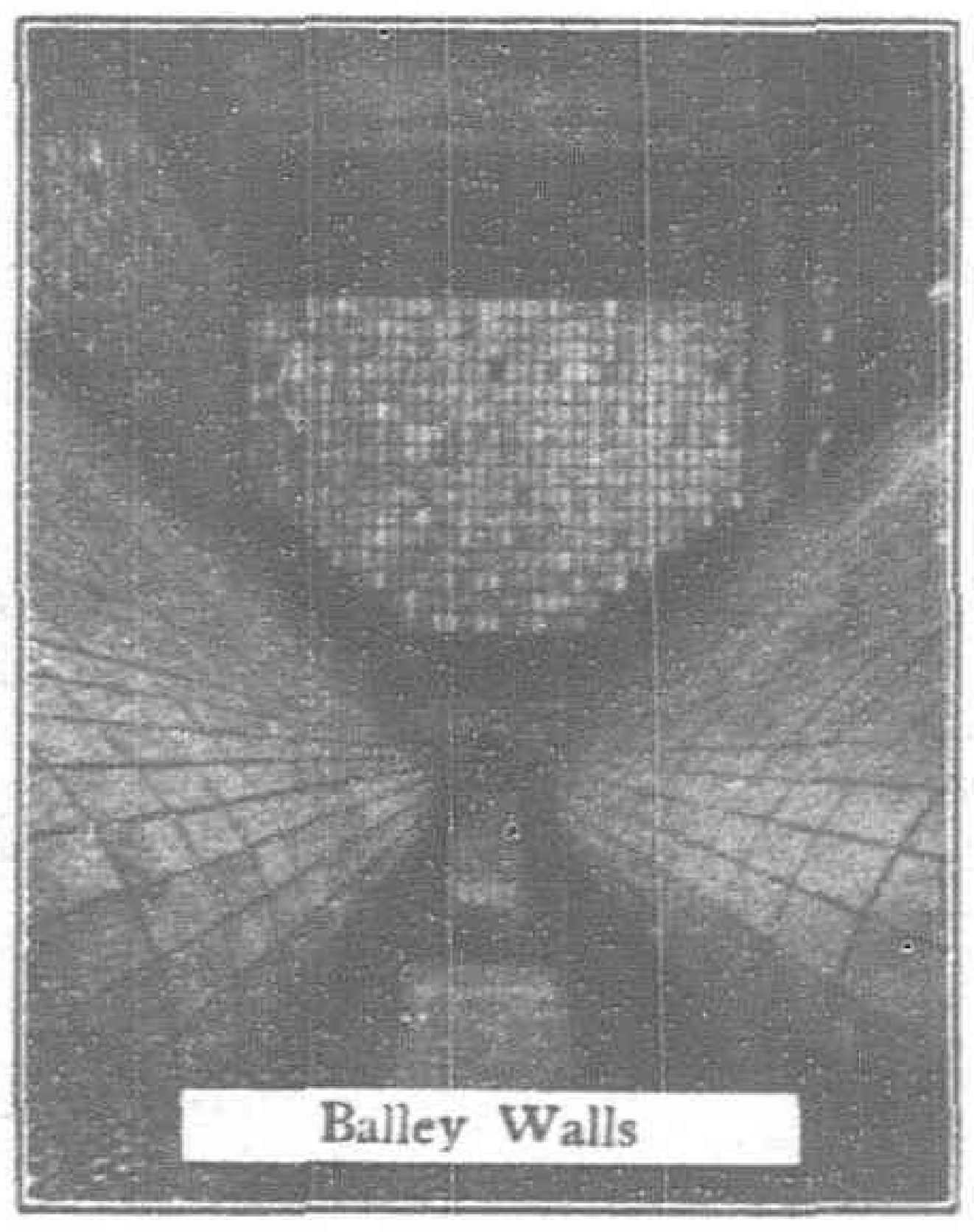
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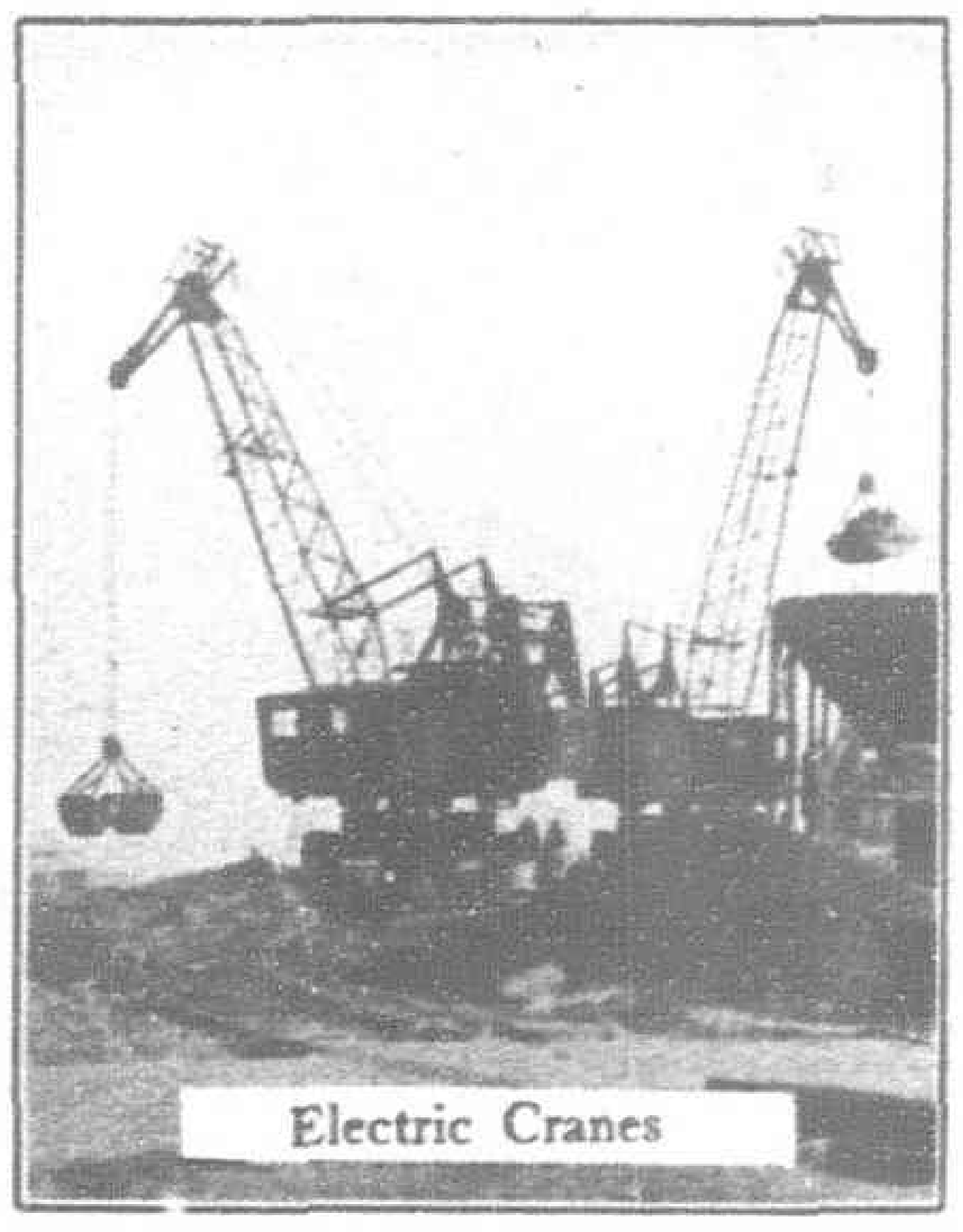
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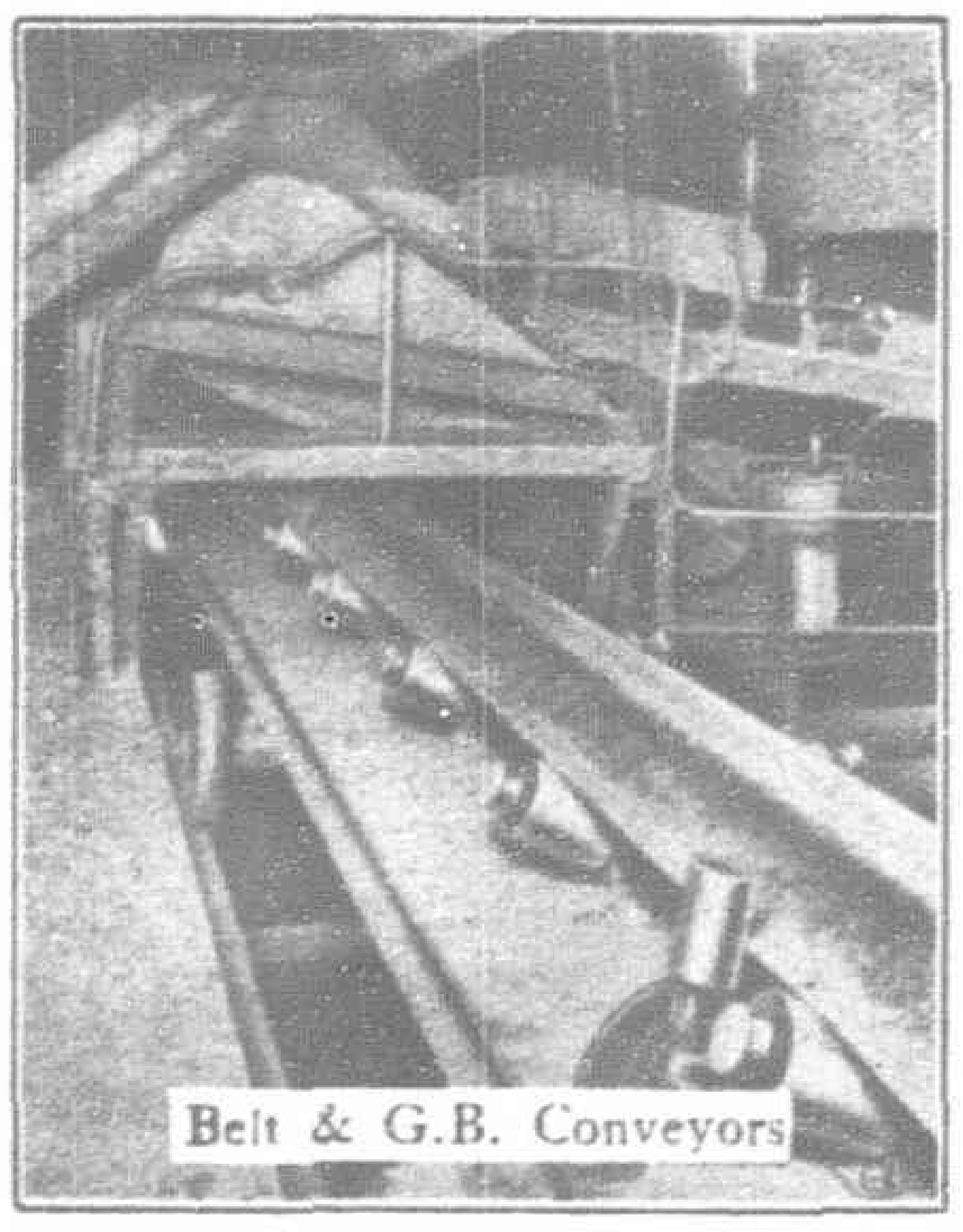
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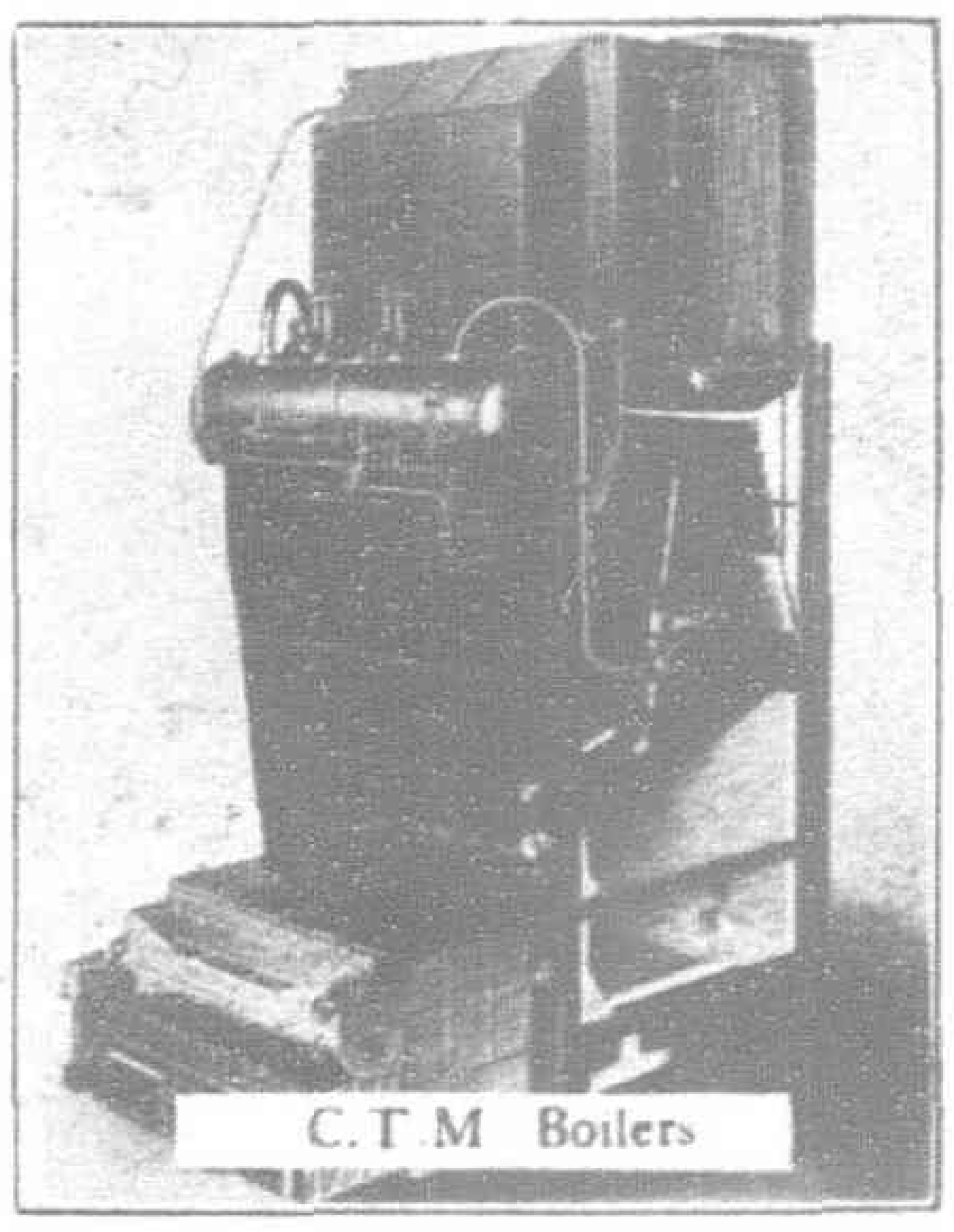
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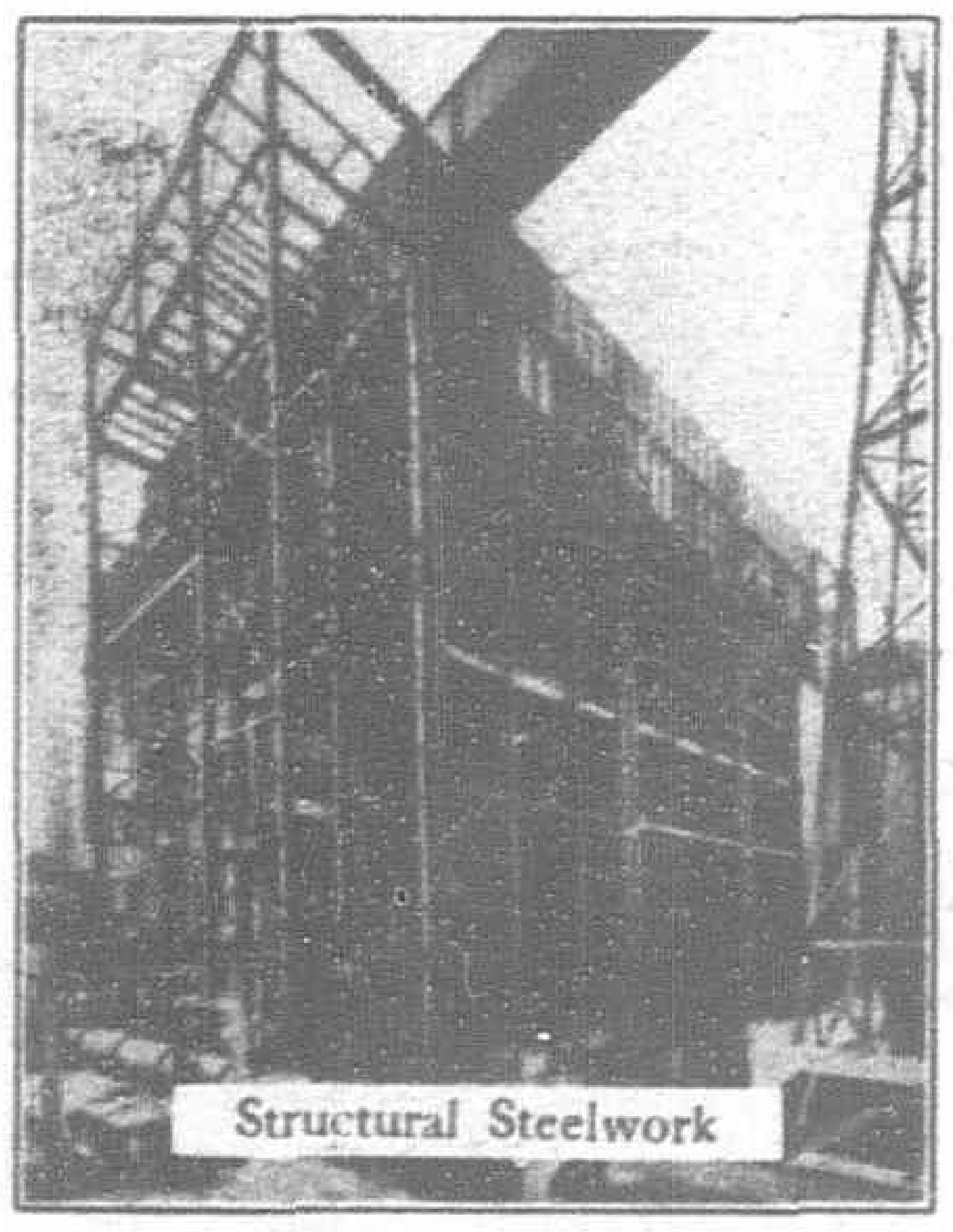
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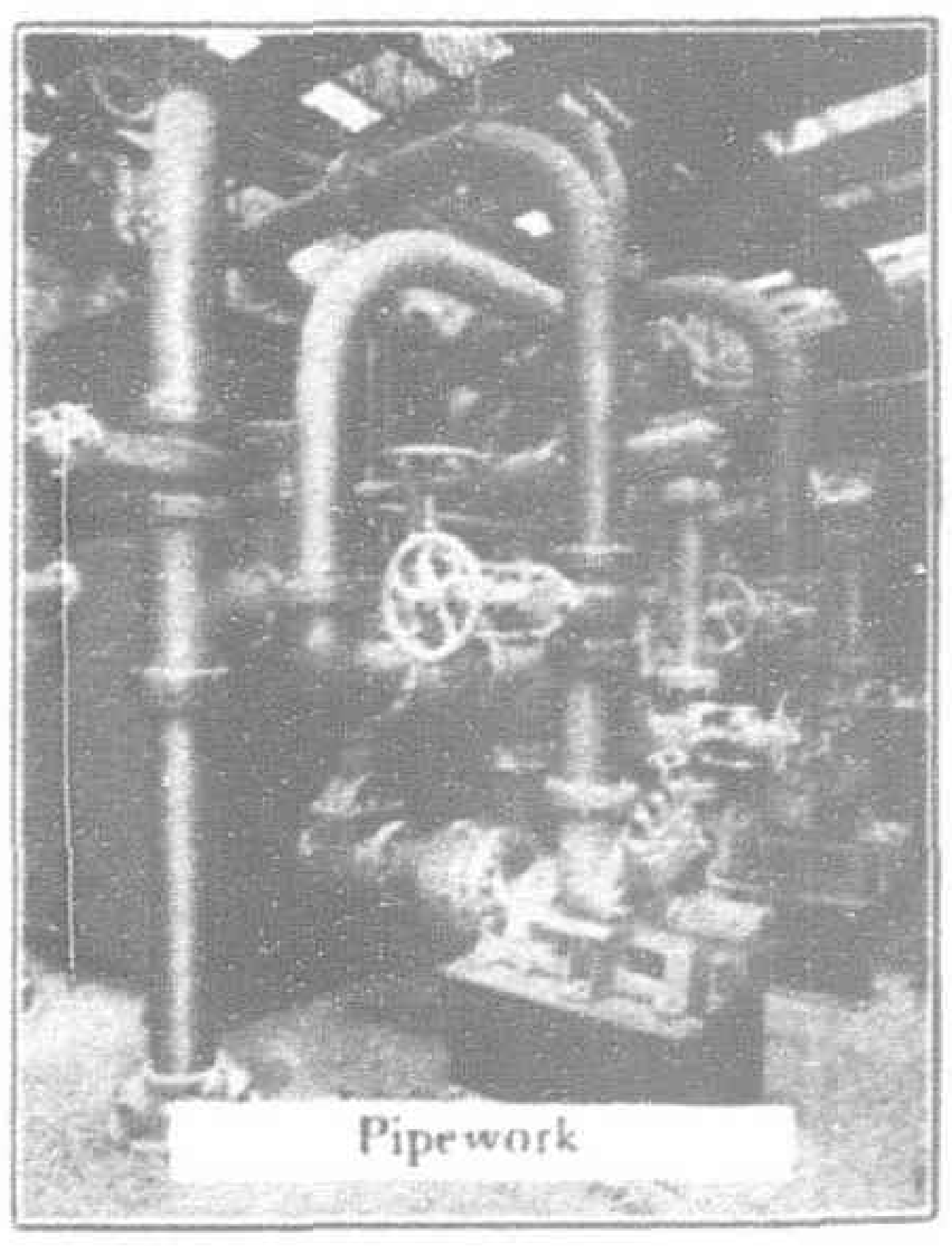
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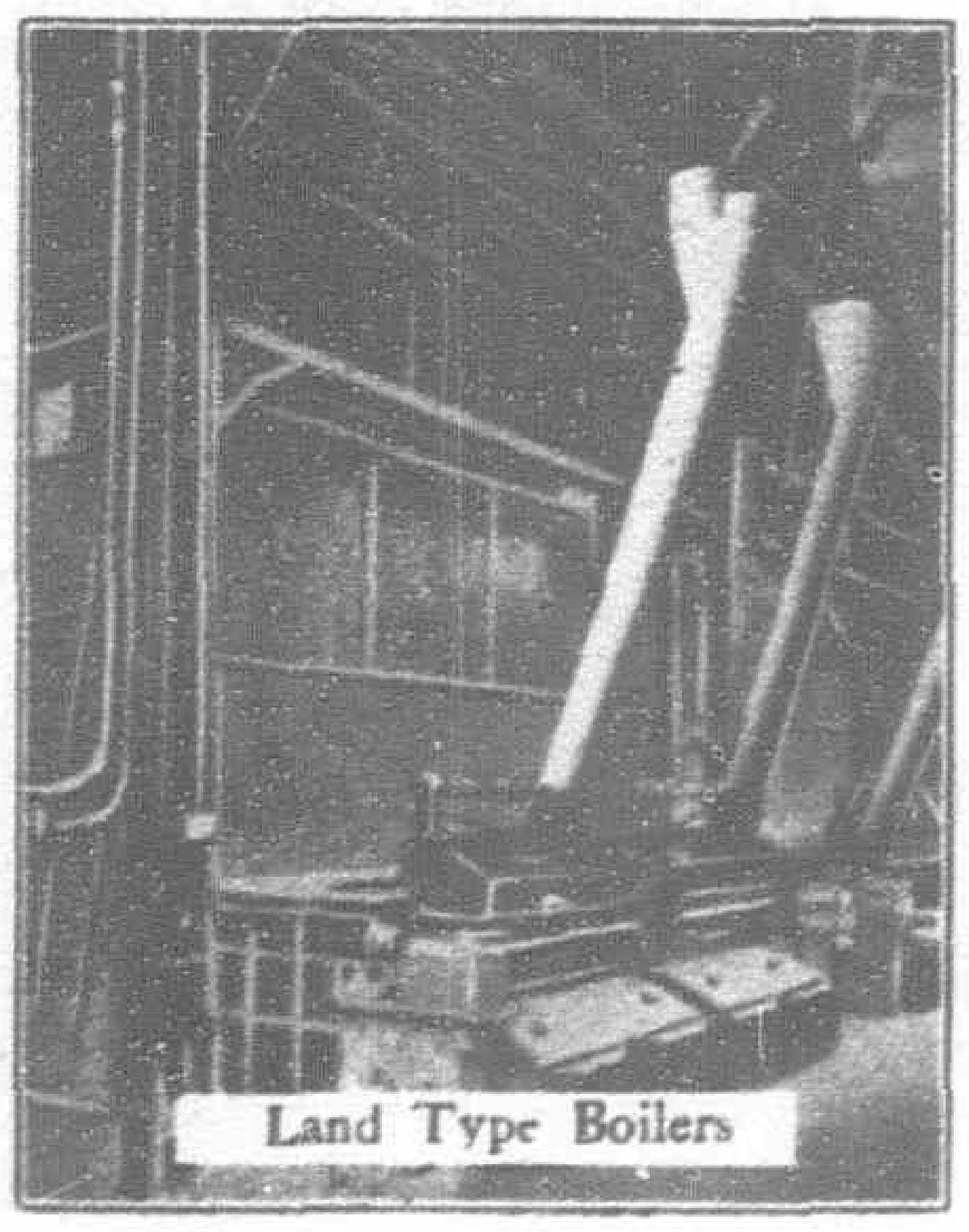
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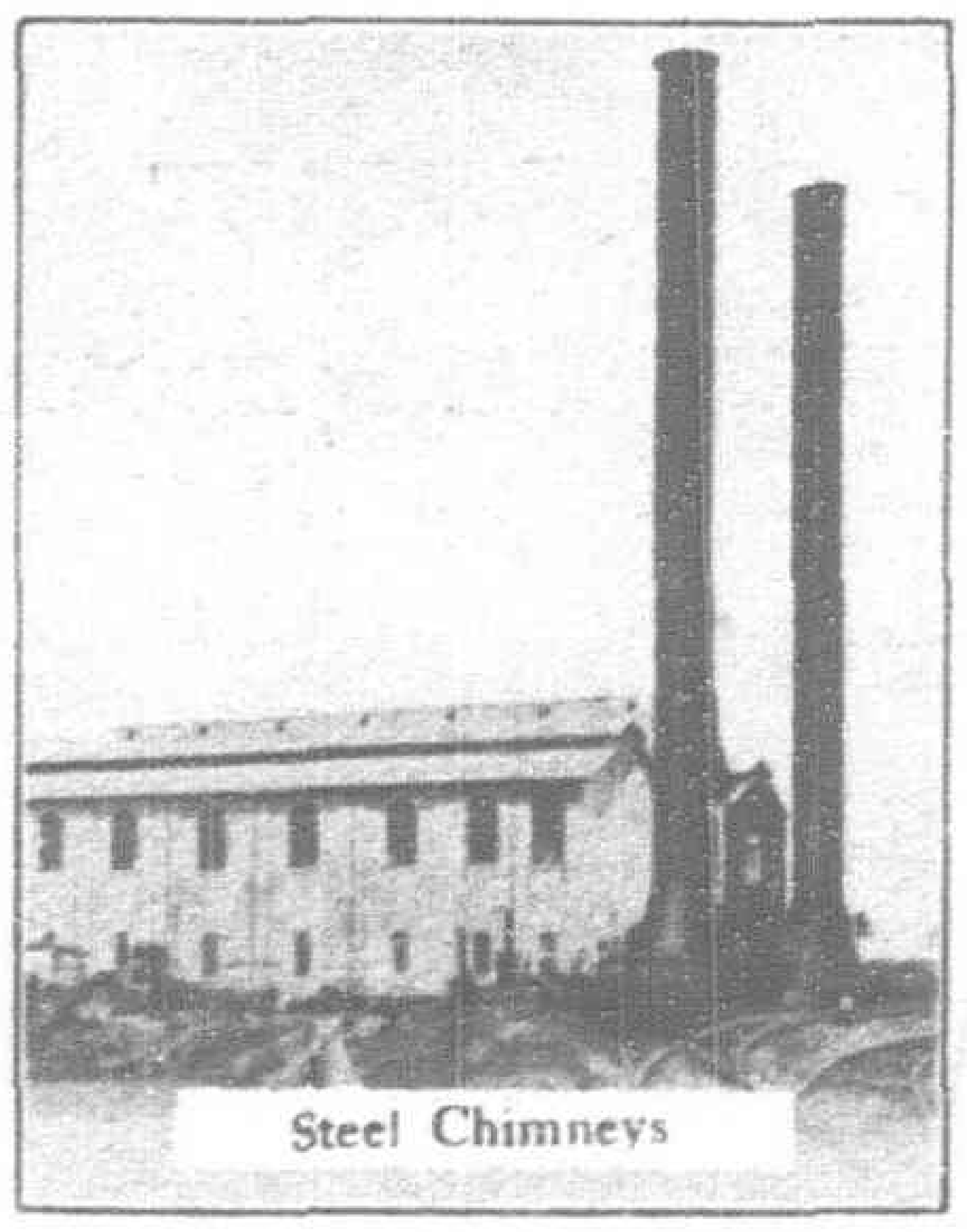
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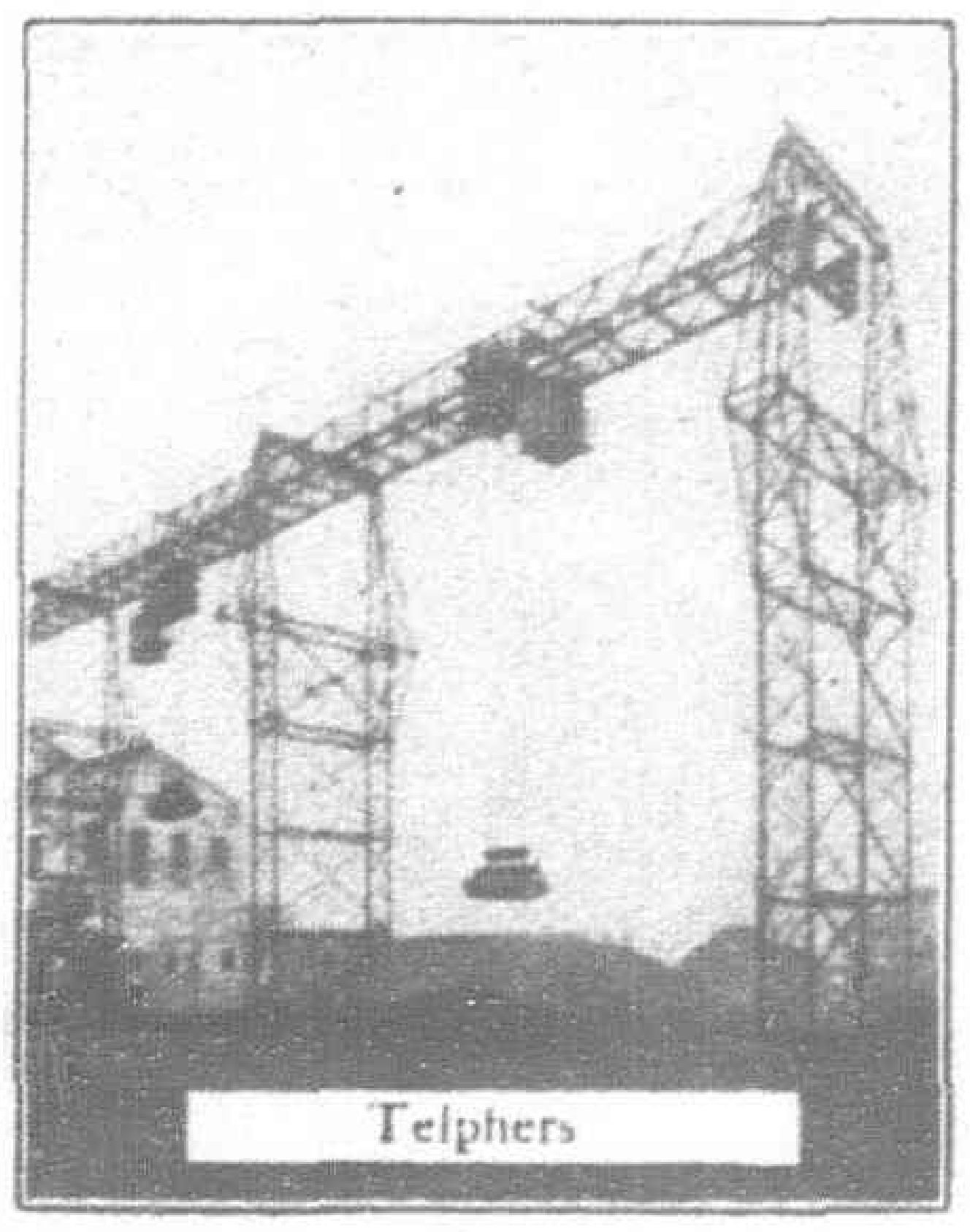
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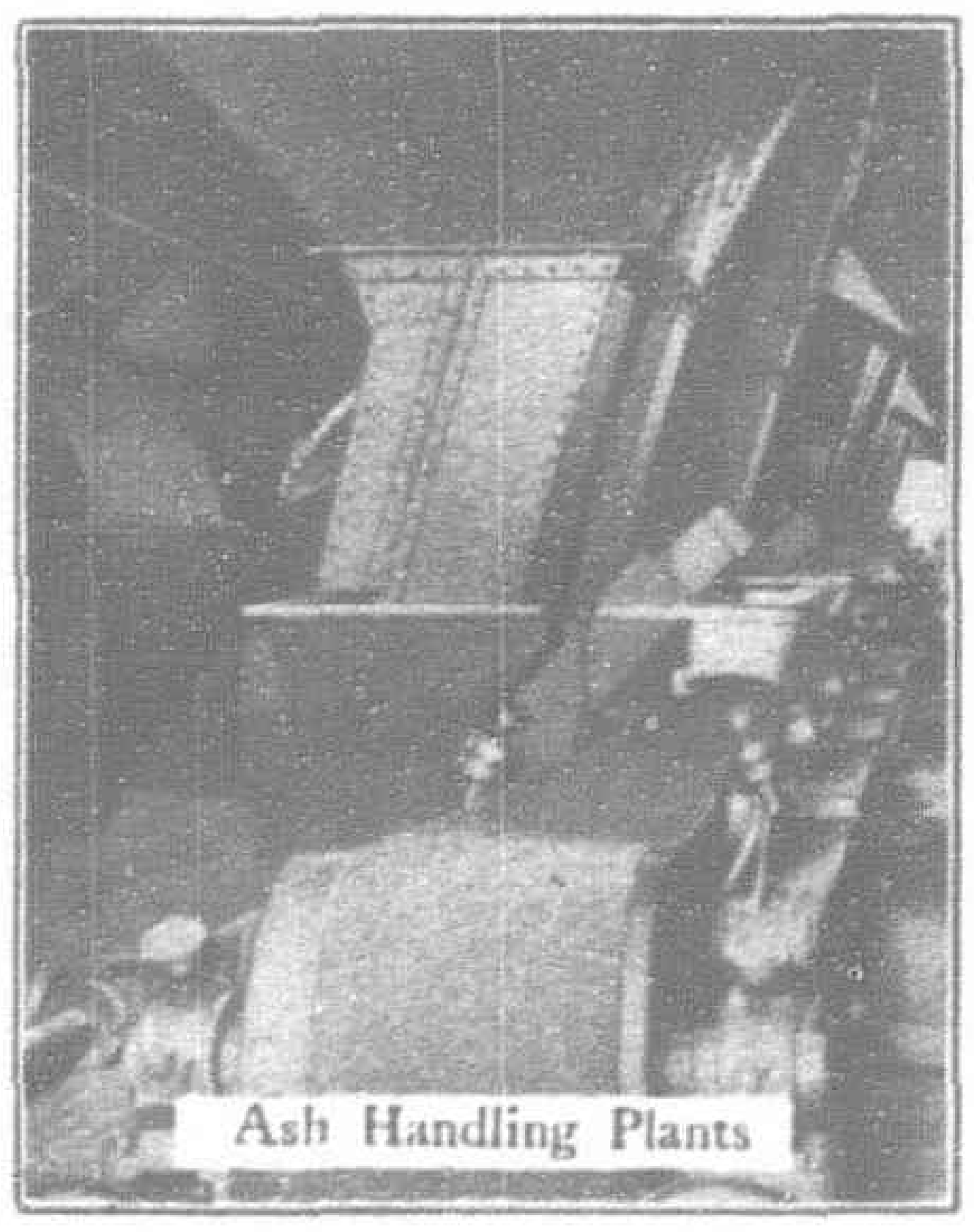
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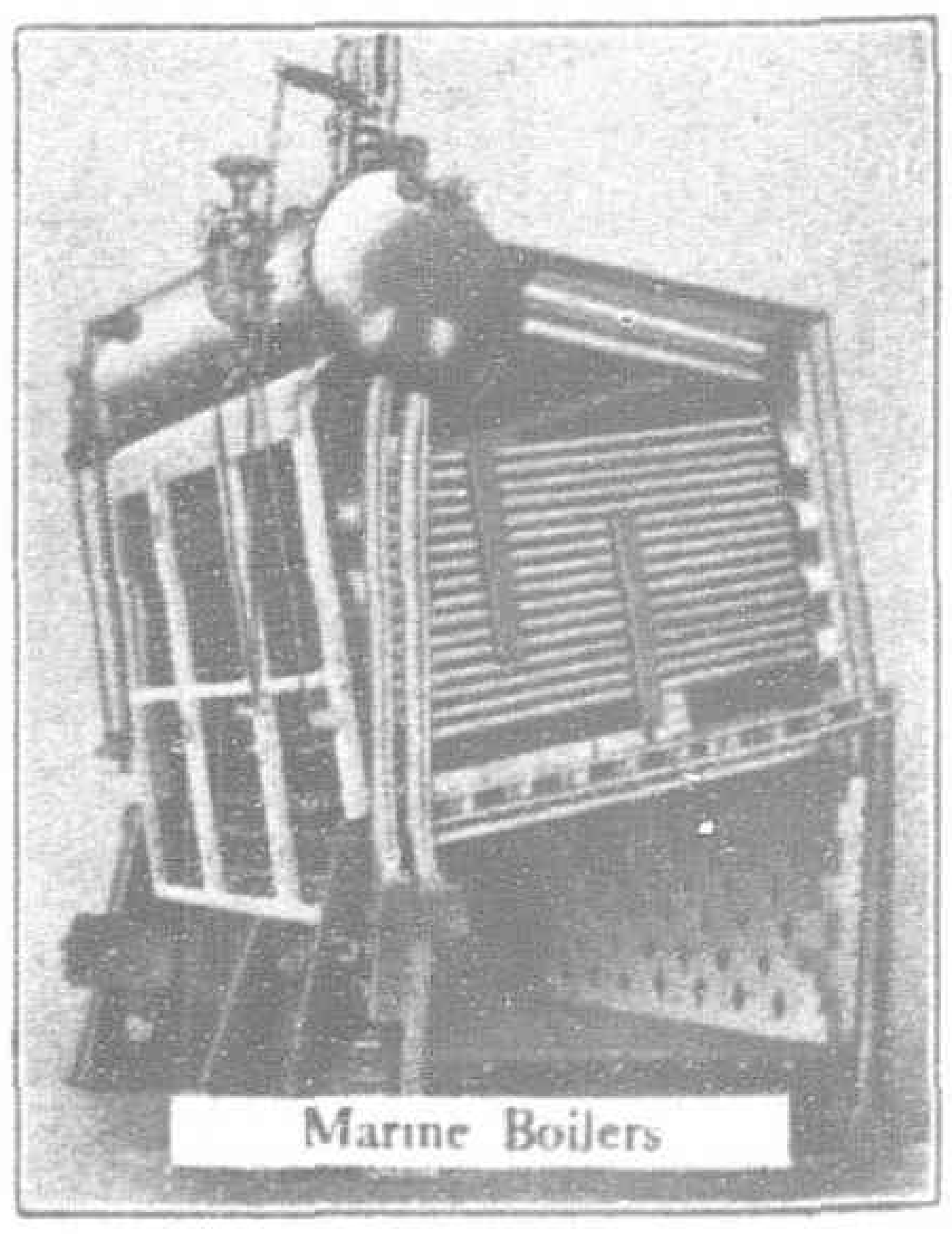
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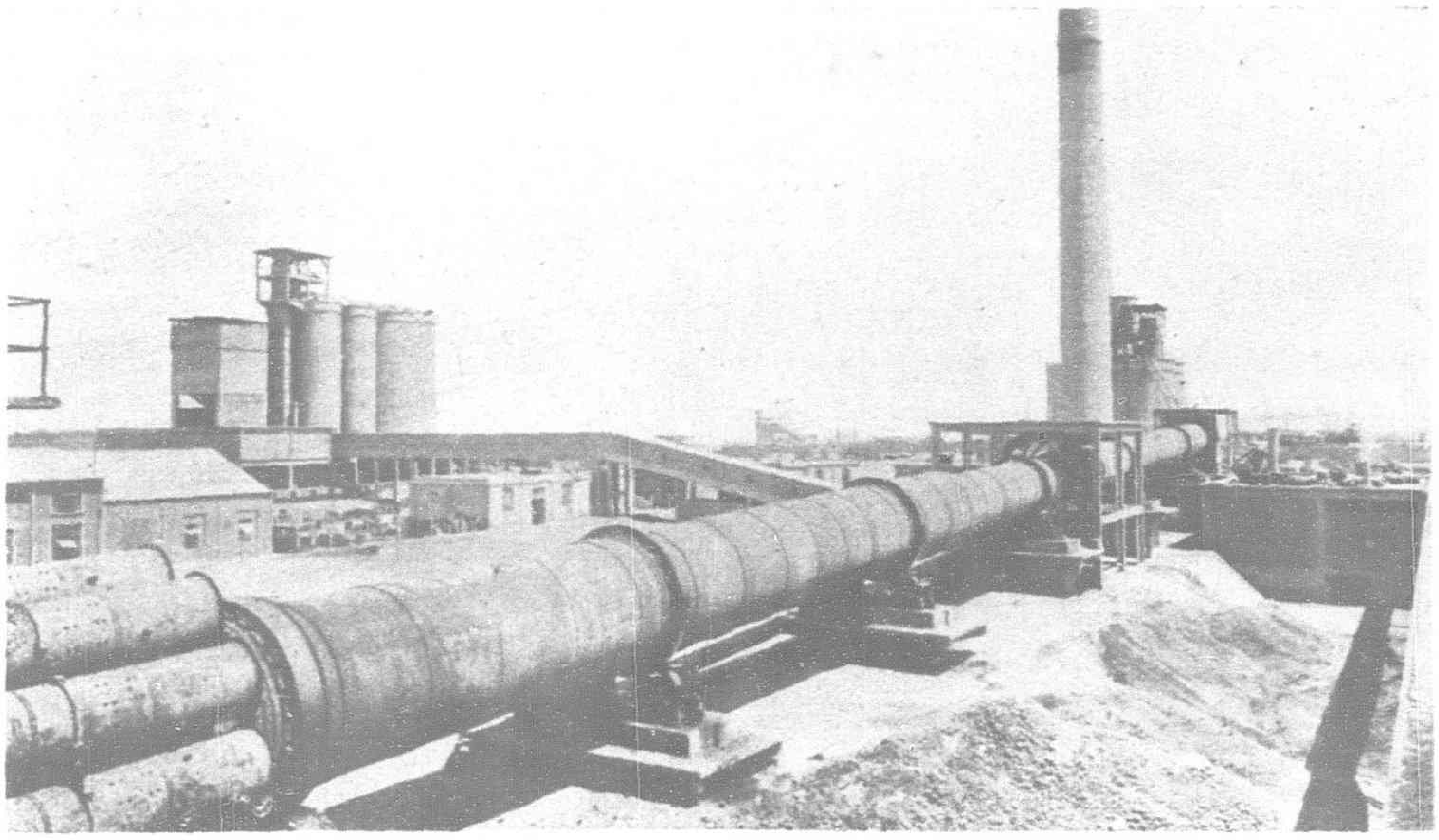

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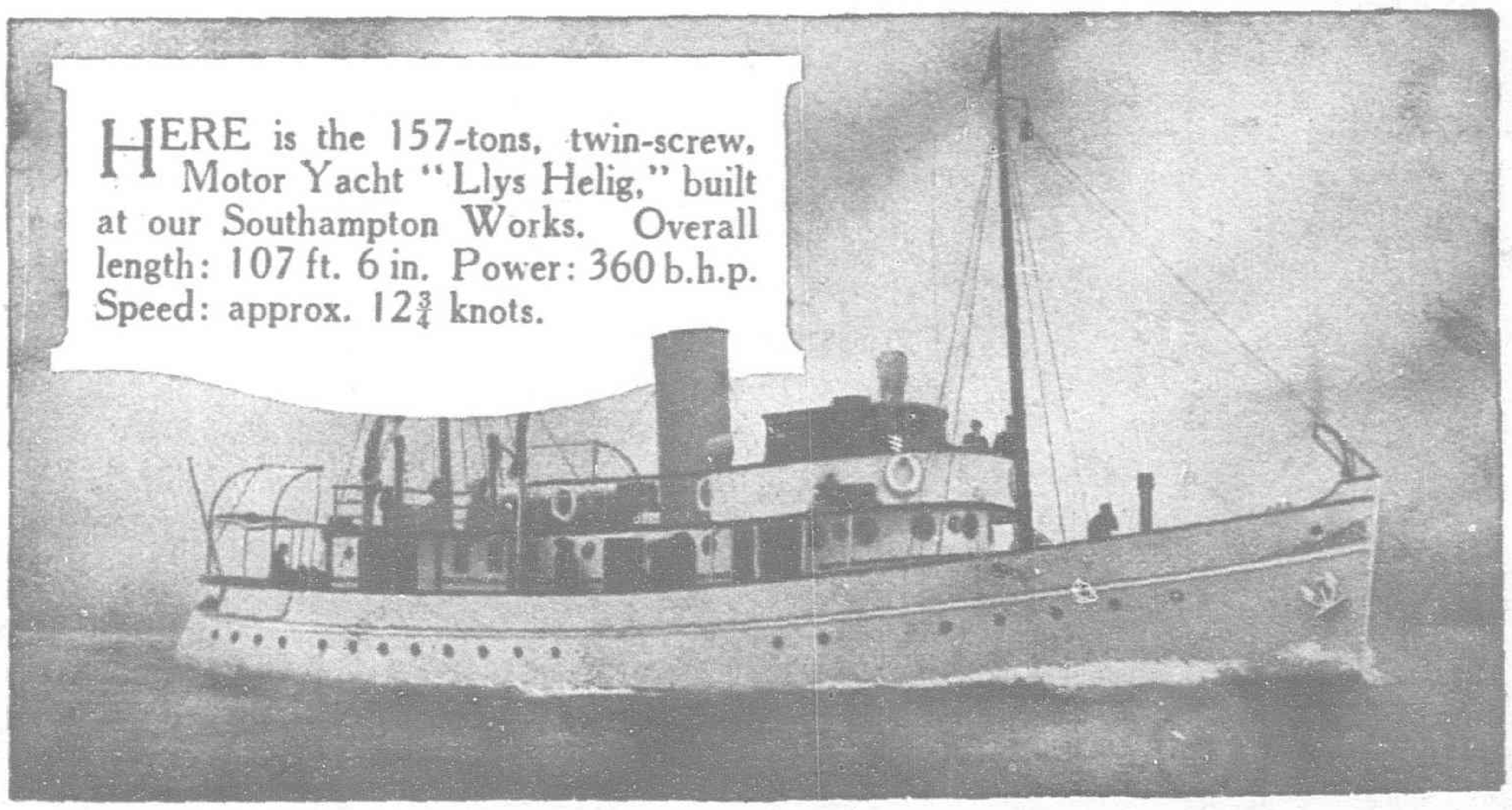

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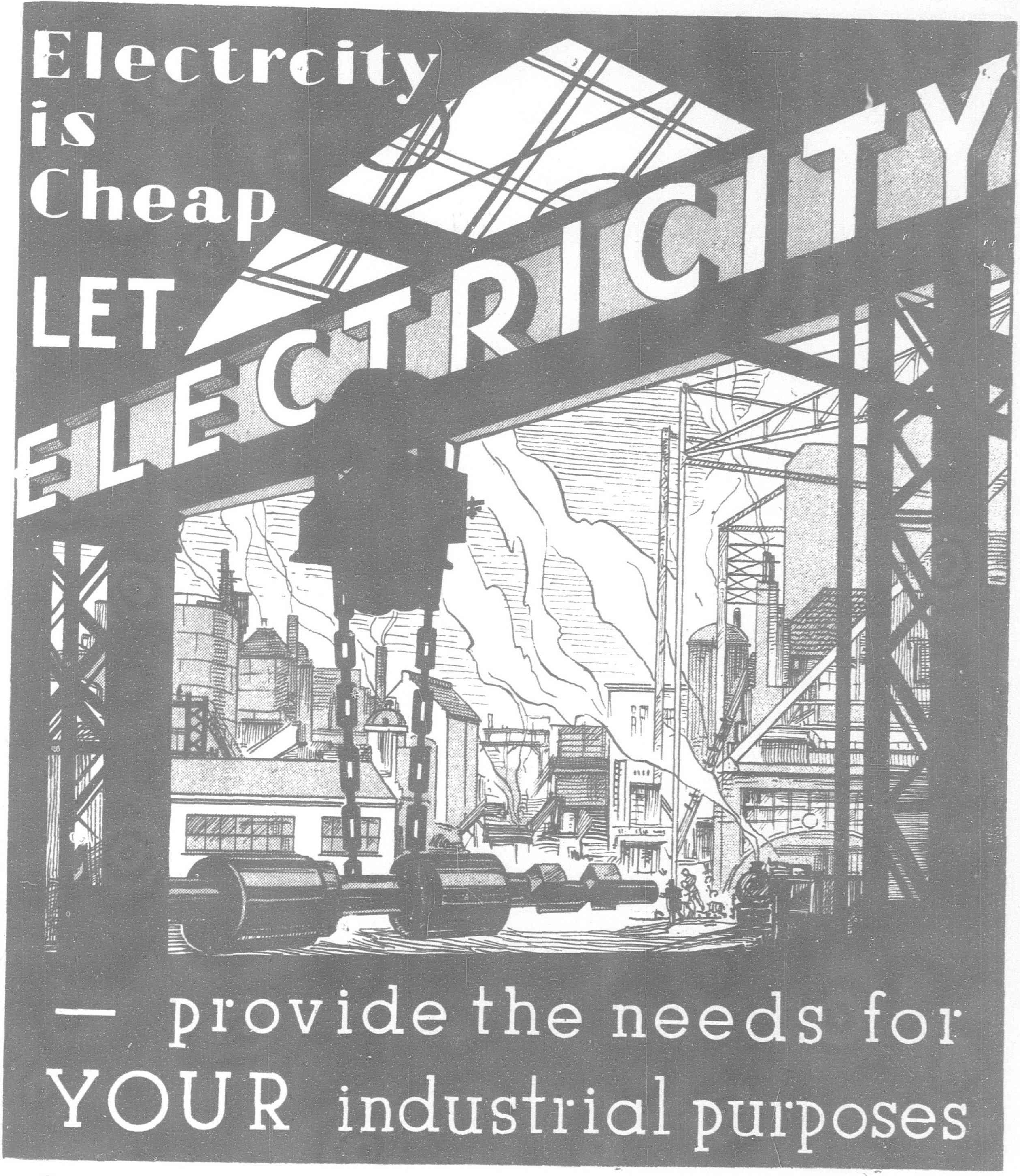

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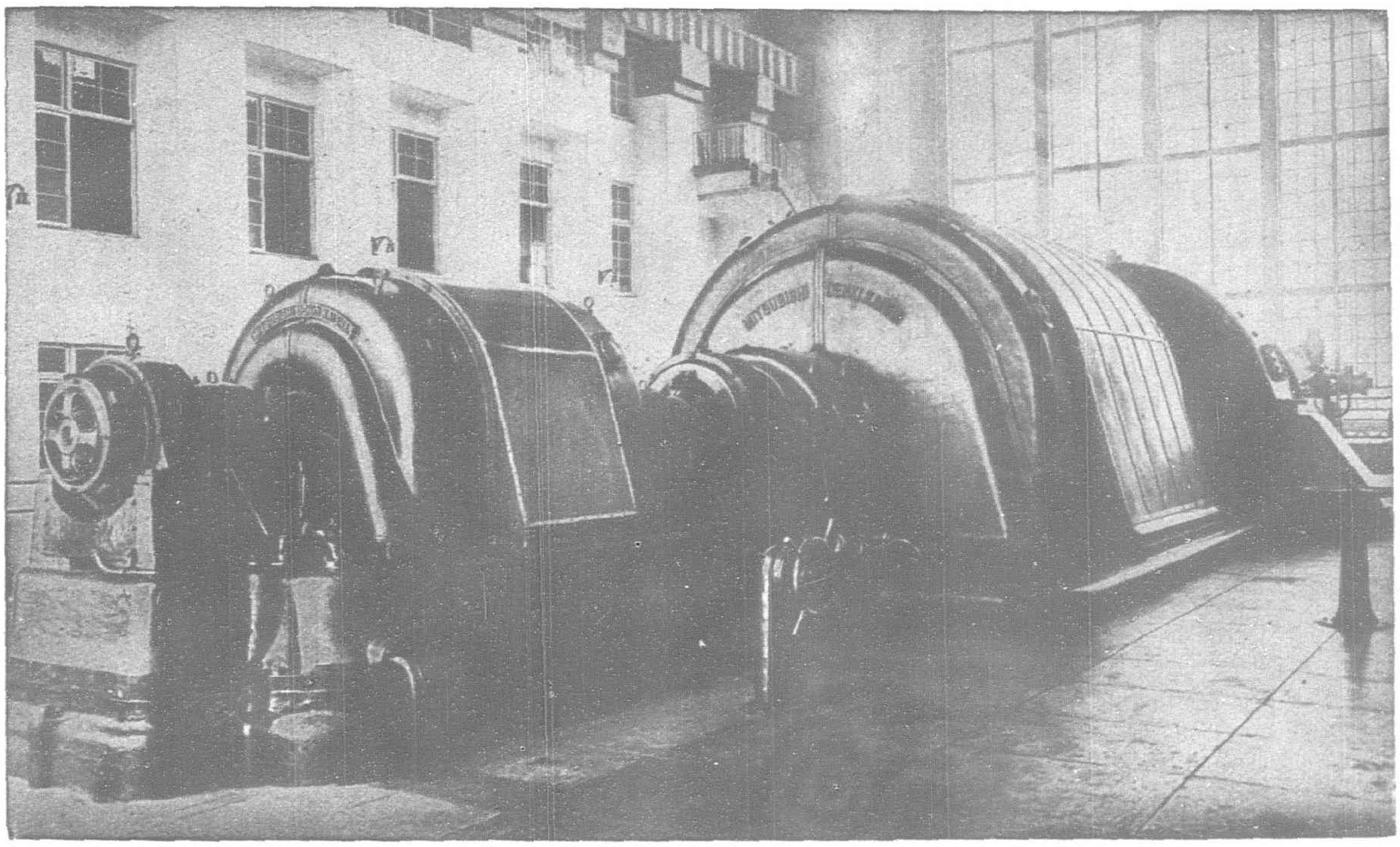

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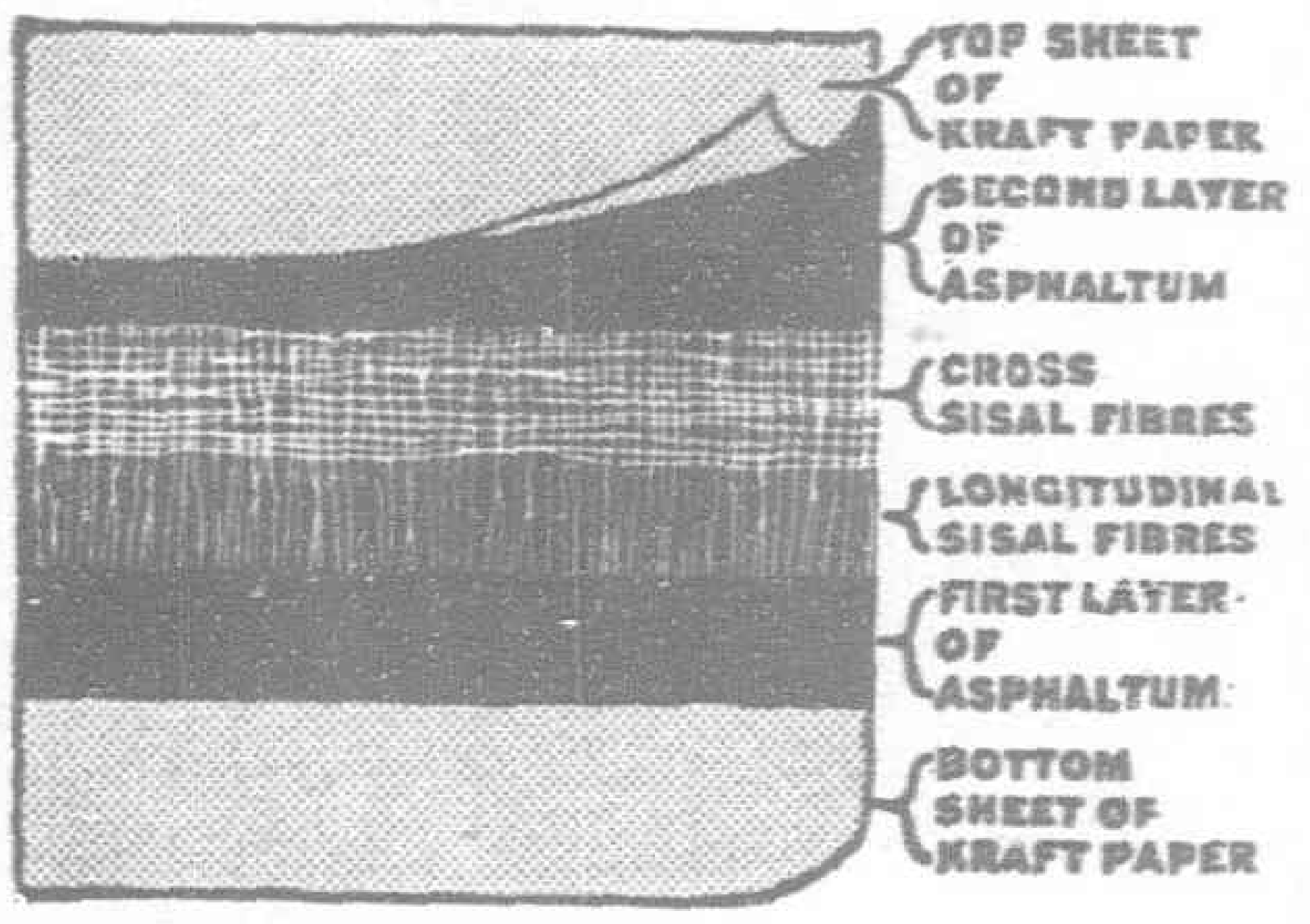
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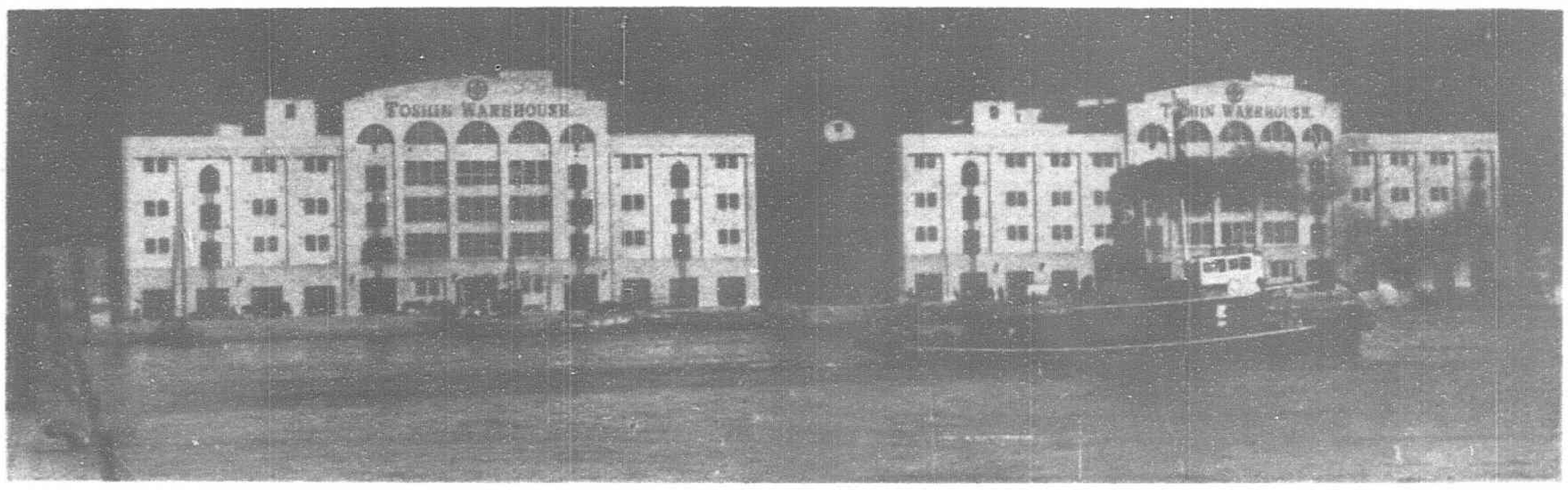

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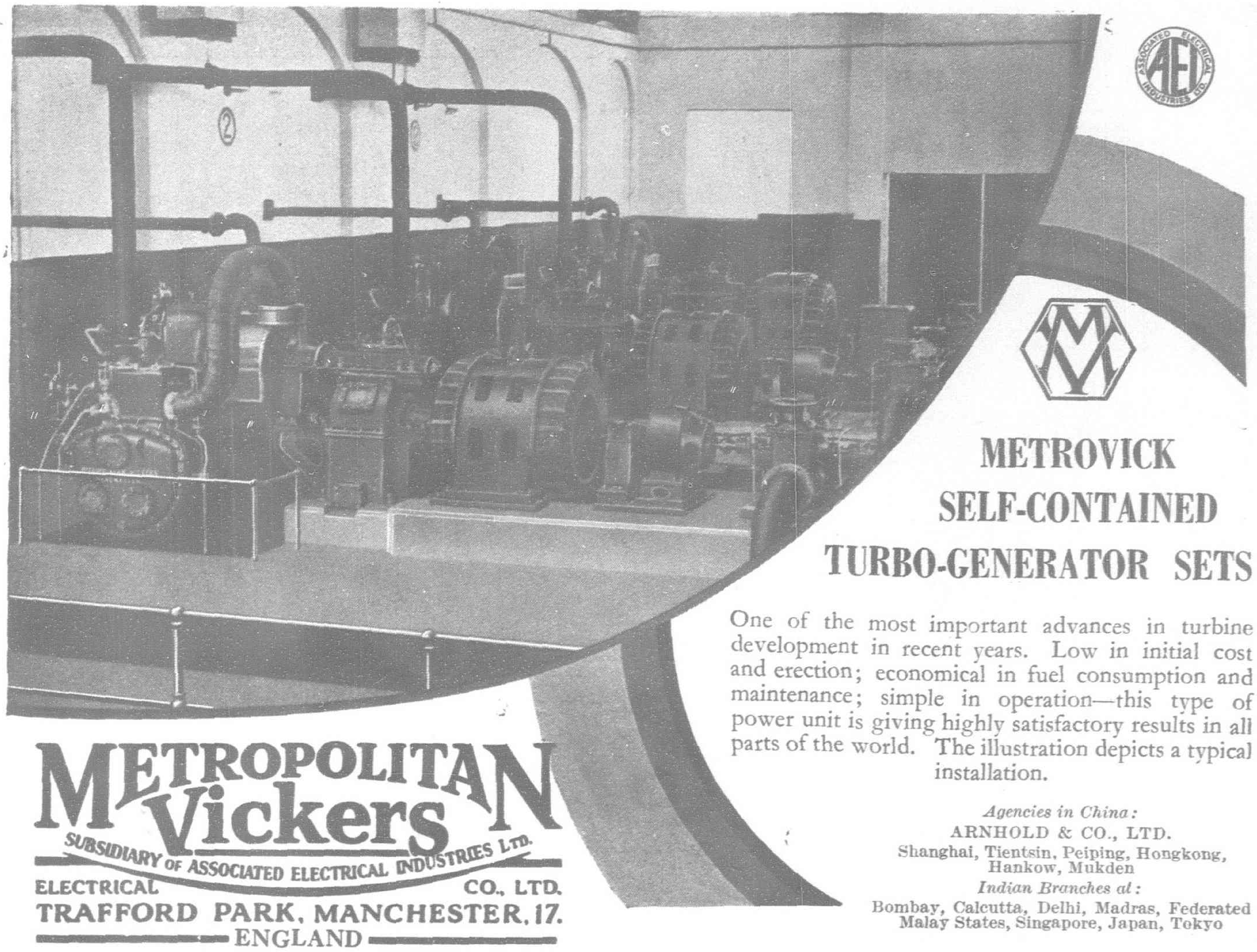

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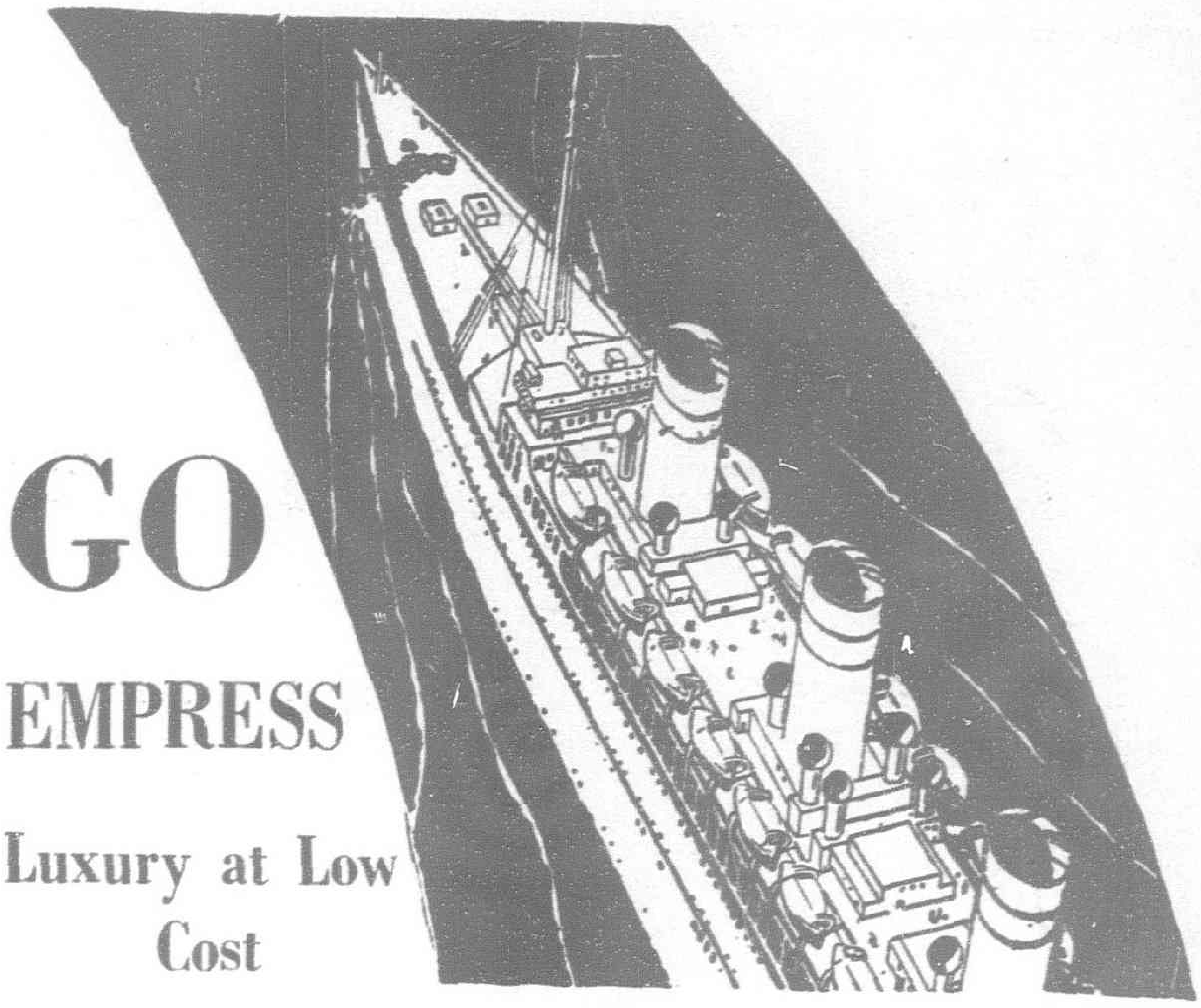

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S.S.	*From Shanghai*	*Ar. Vancouver*	*Atlantic Steamship*	*From Saint John*	*European Port.*
E/Japan	Jan. 31*	Feb. 16	Montcalm	Feb. 22	Glasgow, Liverpool
E/Asia	Feb. 15	Mar. 2	Montcalm	Mar. 8	Glasgow, Liverpool
E/Canada	Feb. 28*	Mar. 17	Montcalm	Mar. 22	Glasgow, Liverpool
E/Russia	Mar. 10	Mar. 25	*D/York	Mar. 30	Glasgow, Liverpool
E/Japan	Mar. 24*	Apr. 9	*D/Bedford	Apr. 13	Glasgow, Liverpool

*From Halifax.

				From Montreal	
E/Asia	Apr. 7*	Apr. 26	Montclare	May 3	Glasgow, Belfast, Liverpool
E/Canada	Apr. 21*	May 8	Montrose	,, 15	Havre, Southampton
			D/Richmond	.. 17	Glasgow, Belfast, Liverpool
			E/Britain	,, 21†	Cherbourg, Southampton
E/Russia	May 5	May 20	D/York	.. 24	Glasgow, Belfast, Liverpool
			E/Australia	.. 29‡	Cherbourg, Southampton
E/Japan	May 19*	June 4	D/Bedford	.. 8	Glasgow, Belfast, Liverpool
			E/Britain	.. 15‡	Cherbourg, Southampton
			E/Australia	.. 20‡	Cherbourg, Southampton
E/Asia	June 2*	June 21	Montrose	.. 26	Havre, Southampton
			D/Atholl	.. 29	Glasgow, Belfast, Liverpool
			E/Britain	.. 29‡	Cherbourg, Southampton
E/Canada	June 16*	July 3	Montcalm	.. 7	Havre, Southampton
			E/Britain	.. 12‡	Cherbourg, Southampton
E/Russia	June 30	July 15	D/York	.. 19	Glasgow, Belfast, Liverpool

* Sails via Honolulu. † Sails from Quebec. ‡ Sails from New York.

Frequent sailings by other Canadian Pacific Atlantic Ships also available.

Beginning with the "EMPRESS OF JAPAN" March 24th sailing All-Inclusive Tours covering Sleeping Car accommodation, meals on train and hotel across Canada are available.

ONE SYSTEM THROUGHOUT—ORIENT TO EUROPE

Canadian Pacific all-steel trains adjoin pier at Vancouver—transfers arranged train to dock at Montreal—C.P.R. trains go alongside ships at Saint John and Quebec.

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WORLD'S GREATEST TRAVEL SYSTEM

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TOKYO "

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Bentley's Complete
Phrase, Etc.

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(MITSUBISHI TRADING CO., LTD.)

Importers and Exporters, Manufacturers, Commission Merchants, Brokers, Ship Owners

Head Office :
MARUNOUCHI, TOKYO

BRANCHES and AGENCIES :

Otaru, Yokohama, Nagoya, Osaka, Kobe, Kure, Moji, Taihoku, Takow, Seoul, Dairen, Tientsin, Tsingtao, Shanghai, Hankow, Hongkong, Singapore, Soerabaya, Sydney, London, New York, Seattle, San Francisco, Paris, Lyon, Berlin

EXPORTING :

Coal, Copper and all Other Descriptions of Metals and Ores, Cereals, Portland Cement, Oil, Paper, Fertilizer, Glass, Canned Goods, Silk Goods and General Oriental Products and Merchandise

IMPORTING :

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FLEET OWNED :

Two Motor Cargo-vessels - -	11,223 Tons Gross
Three Motor Oil-tankers - - -	21,806 Tons Gross

General Cargo and Oil Tanker Services between Home Ports and Pacific Ports of U.S.A. and Canada

MIIKE COAL

The Finest Steaming and Bunker Coals of the Far East are mined from the famed Miike, Tagawa, Yamano Sunakawa and Kawakami Collieries operated by the

MITSUI

MINING COMPANY, LTD.

Head Office :
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TOKYO, JAPAN

Capital ... ... Yen 100,000,000

Annual Coal Output is equal to one-quarter of Total Japanese Mines

LEAD, SILVER, GOLD, ZINC, COPPER, SPELTER, SULPHUR, COKE, IRON, CHEMICALS and DYES

Are produced from the Company's, KAMIOKA, Lead, Silver and Zinc Mine; SANO, Copper and Zinc Mine; KUSHIKINO, Gold Mine; KONGO, Tungsten Mine; IWAONOBORI, Sulphur and Metal Mine; Zinc Plants, Coke, Dyestuffs and By-products Establishment in Miike

Sole Agents for our Products:

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(MITSUI & Co., Ltd.)

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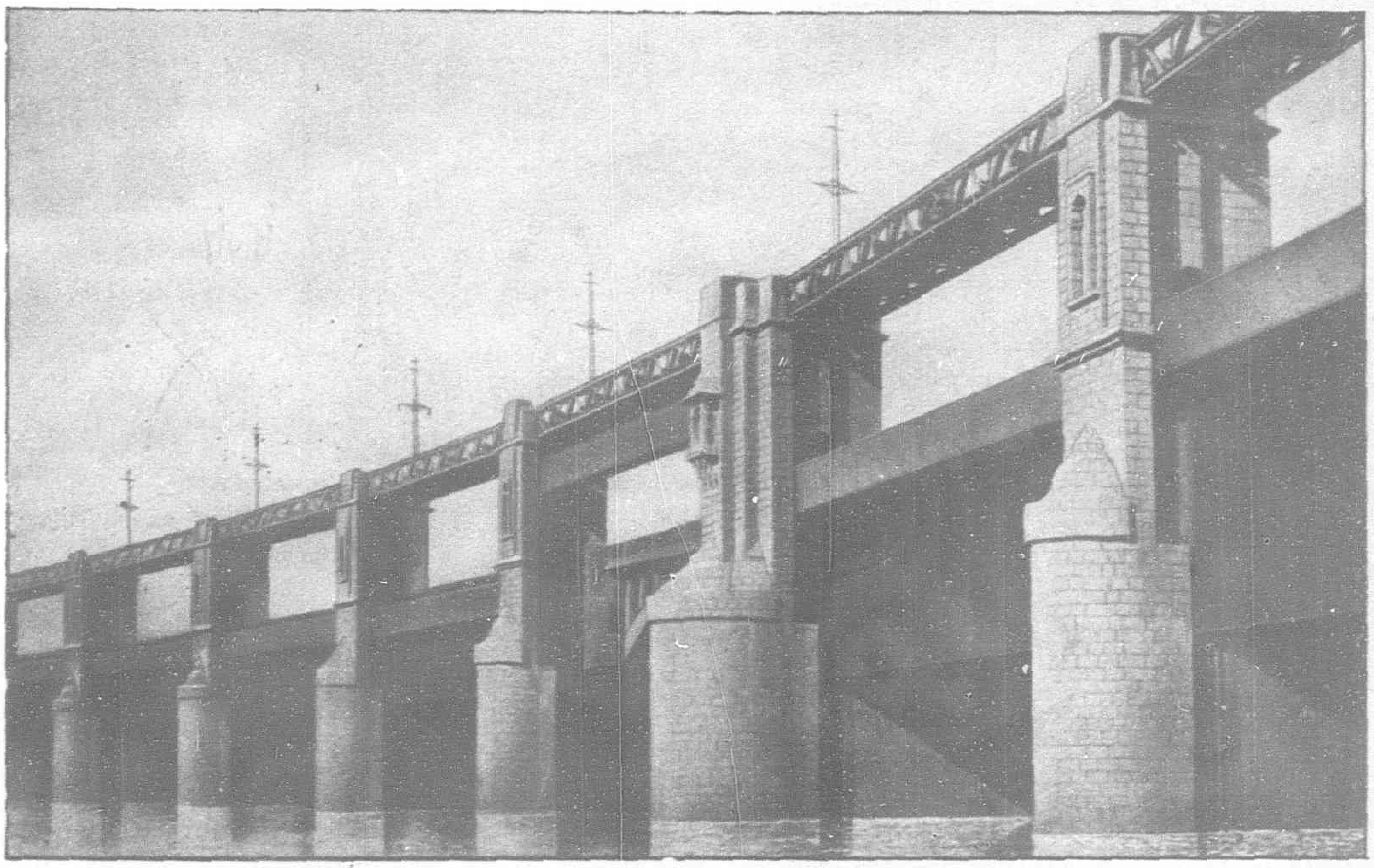
GLENFIELD SLUICE GATES

AT

CAUVERY METTUR

WE have recently completed the manufacture and erection at site of all the sluice gates for this great Dam in the Madras Presidency, India.

Among the many sluice gates supplied are the surplus water spillway gates illustrated on the right. There are sixteen of these gates, each 60-ft. span by 20-ft. deep, and weighing some fifty tons. Each gate is equipped with electrically operated lifting gear.



Glenfield

GLENFIELD AND KENNEDY LIMITED KILMARNOCK

We undertake the design, manufacture and erection in any part of the world of sluice gate equipment up to the largest dimensions. We shall be glad to send a copy of our descriptive pamphlet on request.

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Messrs. BAIST & Co., Canton

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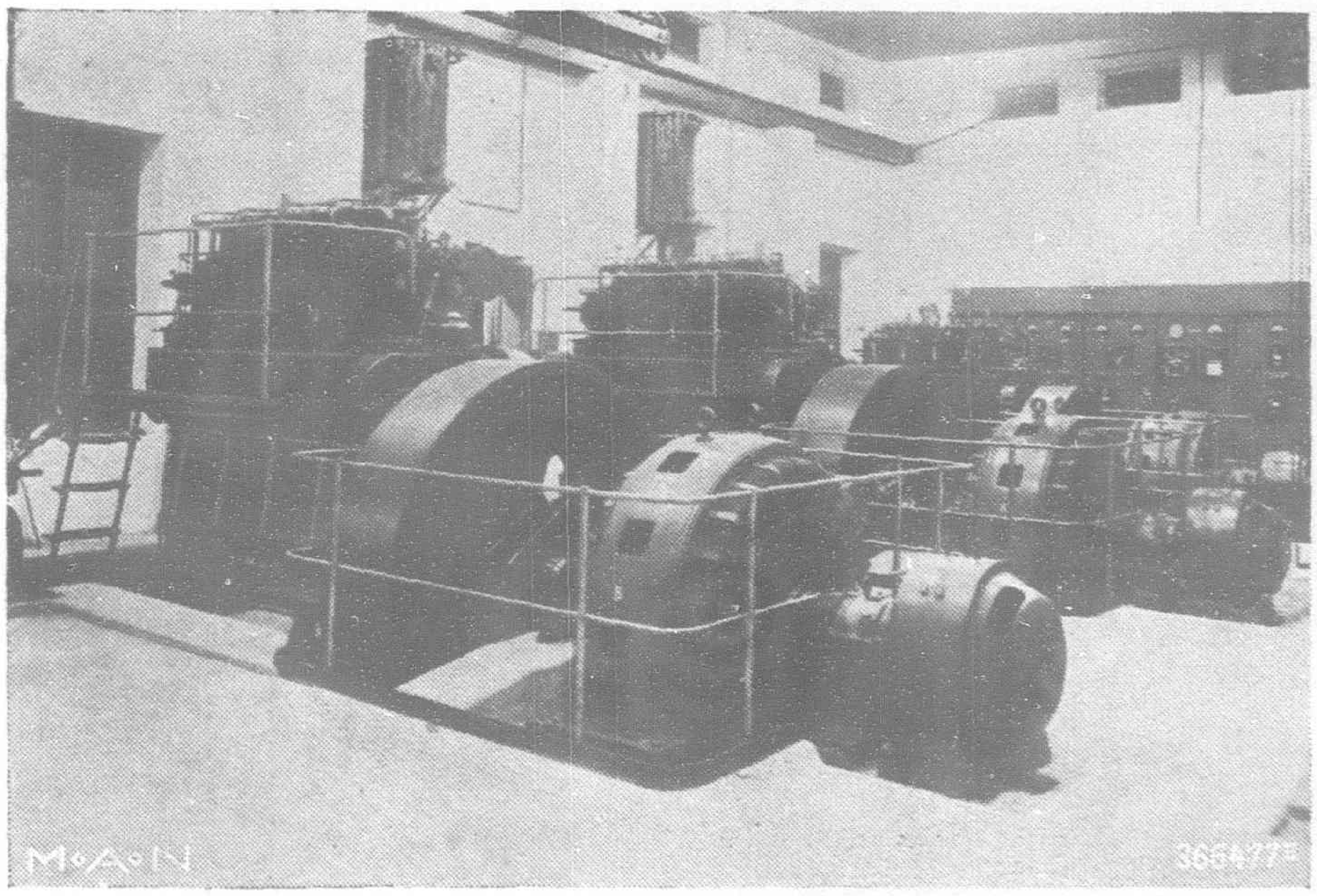

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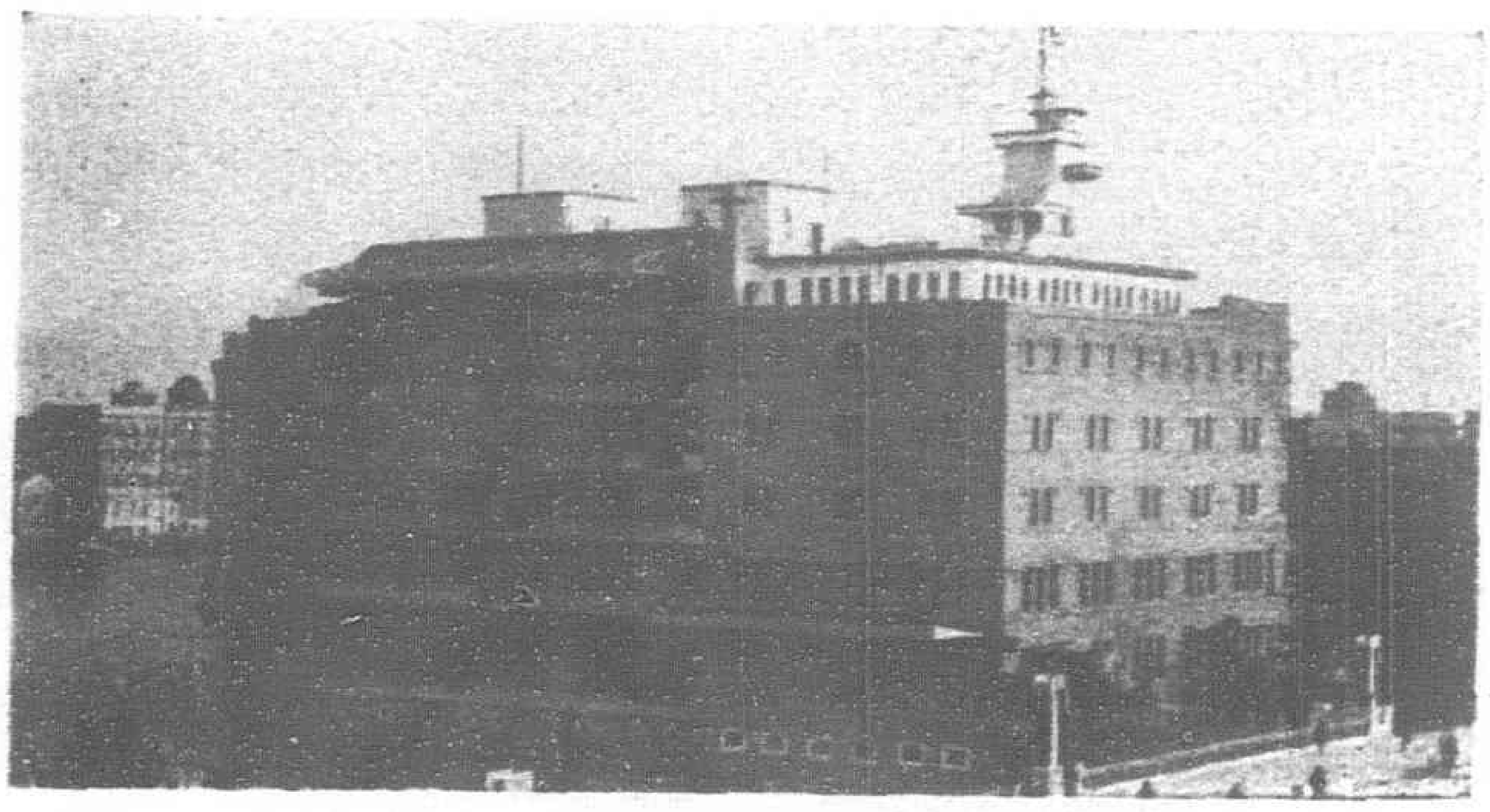
WAREHOUSE CO., LD.

(MITSUBISHI SOKO KAISHA, LTD.)

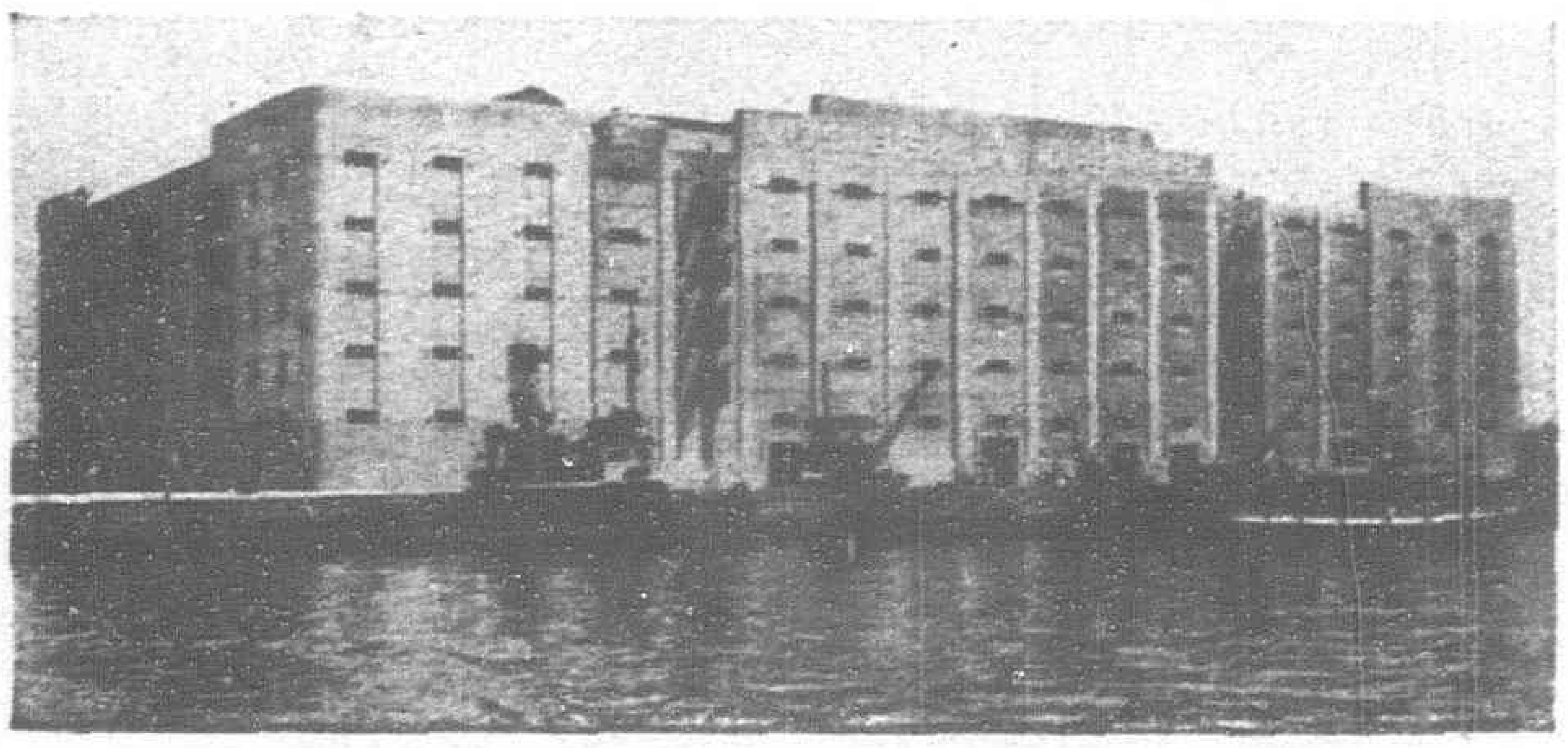
LANDING, SHIPPING AND
FORWARDING AGENTS,
STEVEDORES, CUSTOMS
BROKERS & WAREHOUSEMEN

Capital Paid-up - - Yen 10,000,000
Reserve - - - - - Yen 8,000,000

Managing Director: S. MITSUHASHI



THE NEW WAREHOUSE AT EDOBASHI, TOKYO



THE WAREHOUSE AT SHINKO, KOBE

Head Office: EDOBASHI, NIHONBASHIKU, TOKYO
Branches: YOKOHAMA, KOBE, OSAKA AND MOJI

Affiliated Companies :

KYODO UNYU KABUSHIKI KAISHA
(The Kyodo Express Co., Ltd., Yokohama, Tokyo)

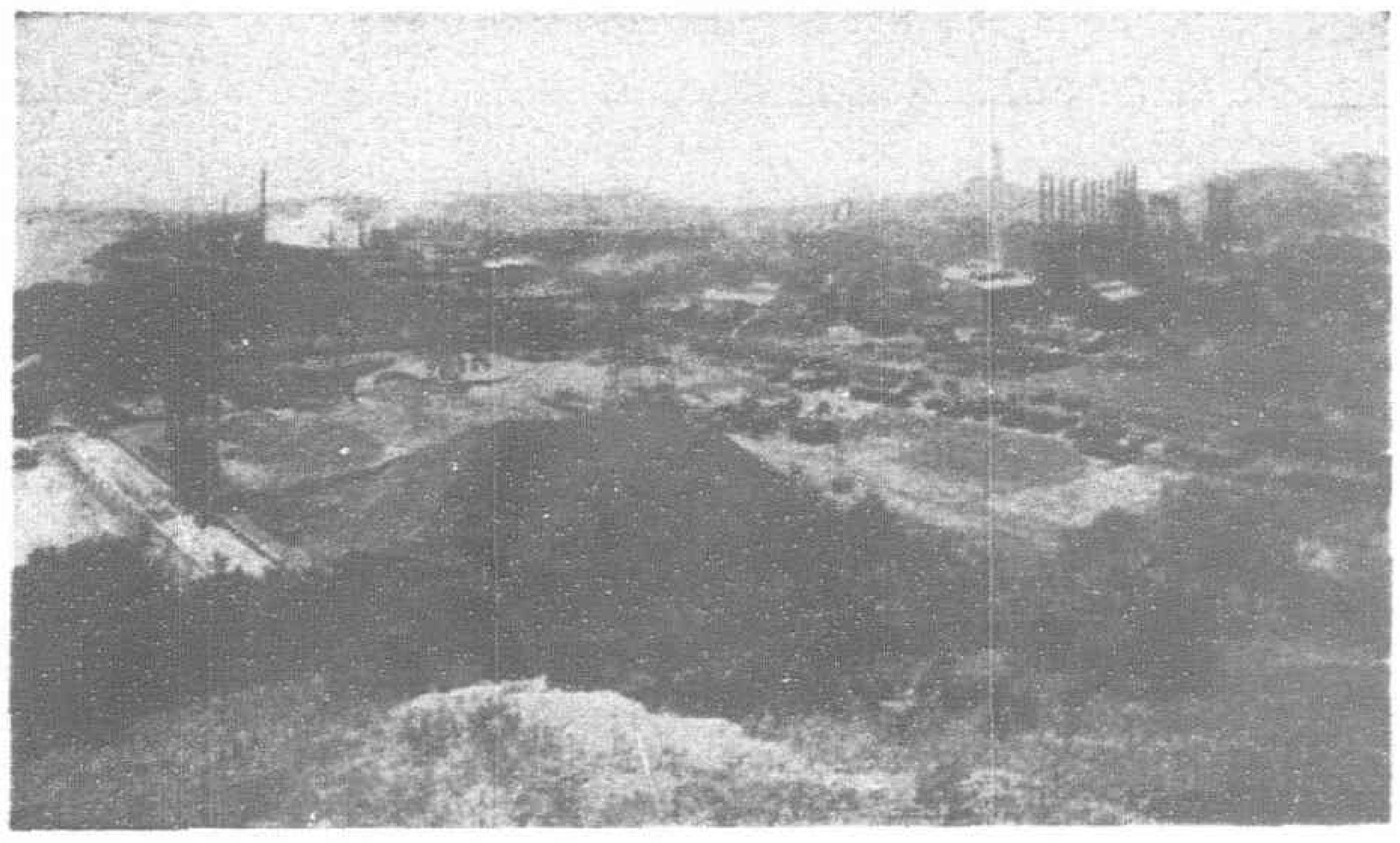
RIOKA SOKO KABUSHIKI KAISHA
(The Rioka Warehouse Co., Ltd., Shanghai)

Cable Address, all Branches: "SOKO"

Mitsubishi Iron and Steel Co.,
LIMITED

(MITSUBISHI SEITETSU KAISHA, LTD.)

Head Office: MARUNOUCHI, TOKYO
Capital (Paid-Up): YEN 25,000,000
Works: KENJIHO, CHOSEN (KOREA)



General View of the Kenjiho Iron and Steel Works

PRODUCTS :

PIG IRON—Basic and Foundry 150,000 tons
STEEL—Plates and Bars

BY-PRODUCTS :

Sulphate of Ammonia ; Pitch ; Naphthalene ; Light Oil ; Medium Oil ; Heavy Oil ; Motor Benzol ; Solvent Naphtha

Sales Agents :

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MITSUBISHI JŪKŌGYŌ KABUSHIKI KAISHA

Successors to

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MITSUBISHI KŌKŪKI KABUSHIKI KAISHA

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Codes :
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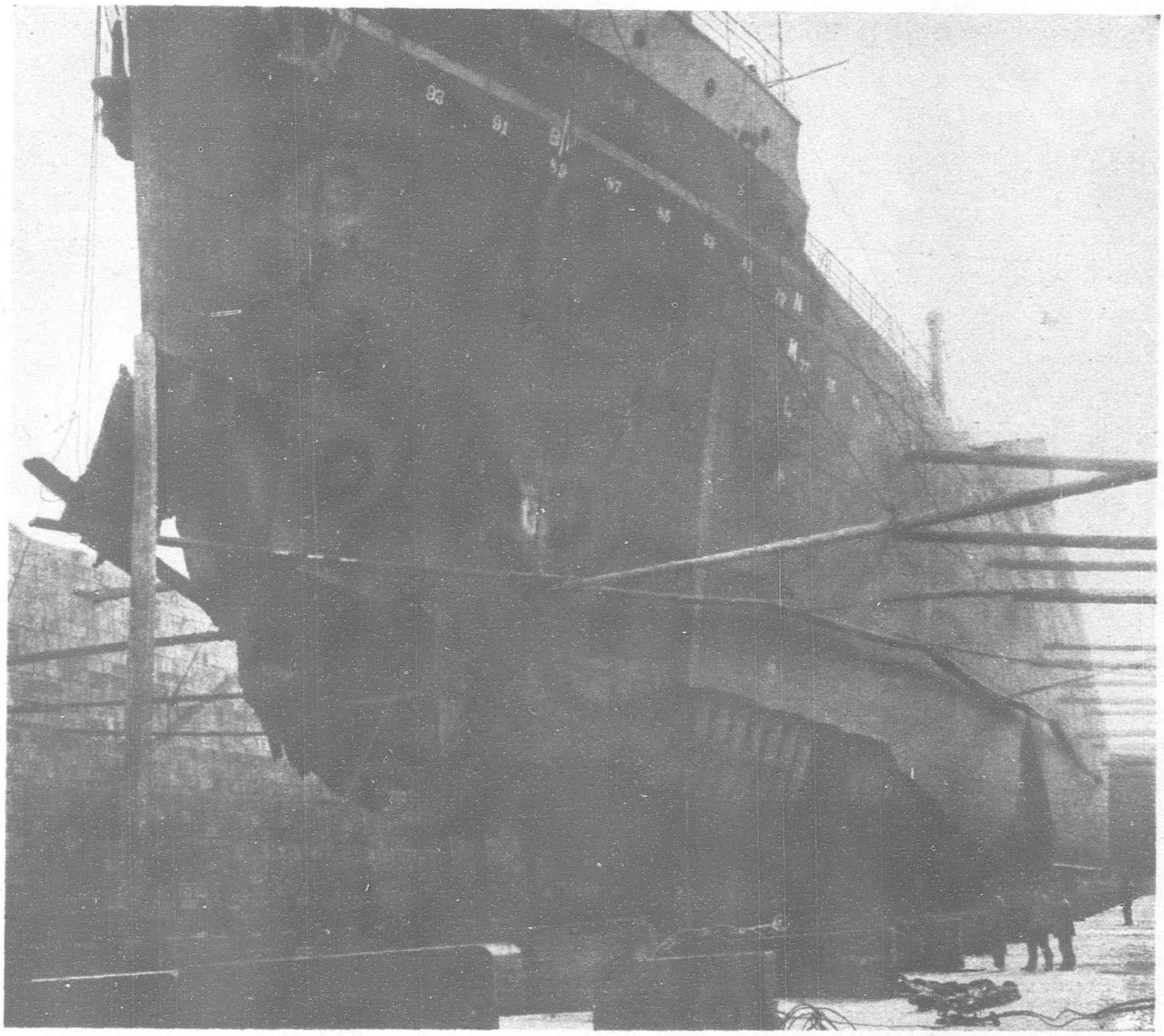
BENTLEY'S, Etc.

The best equipped shipbuilding and ship repairing plant in the Far East.



S.S. "Glenamoy" under repair at the Nagasaki Shipyard and Engine Works

DRY DOCKS

Dock No.	*Extreme length*	*Length on blocks*	*Width of entrance on bottom*	*Width of entrance on bottom*	*Water on blocks at spring tide*
No. 1	523-ft. 0-in.	513-ft. 0-in.	89-ft. 0-in.	77-ft. 0-in.	26-ft. 6-in.
No. 2	371-ft. 0-in.	350-ft. 0-in.	66-ft. 0-in.	53-ft. 0-in.	24-ft. 0-in.
No. 3	728-ft. 9-in.	714-ft. 0-in.	96-ft. 7-in.	88-ft. 7-in.	34-ft. 6-in.

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- - - Real Reliability - - -

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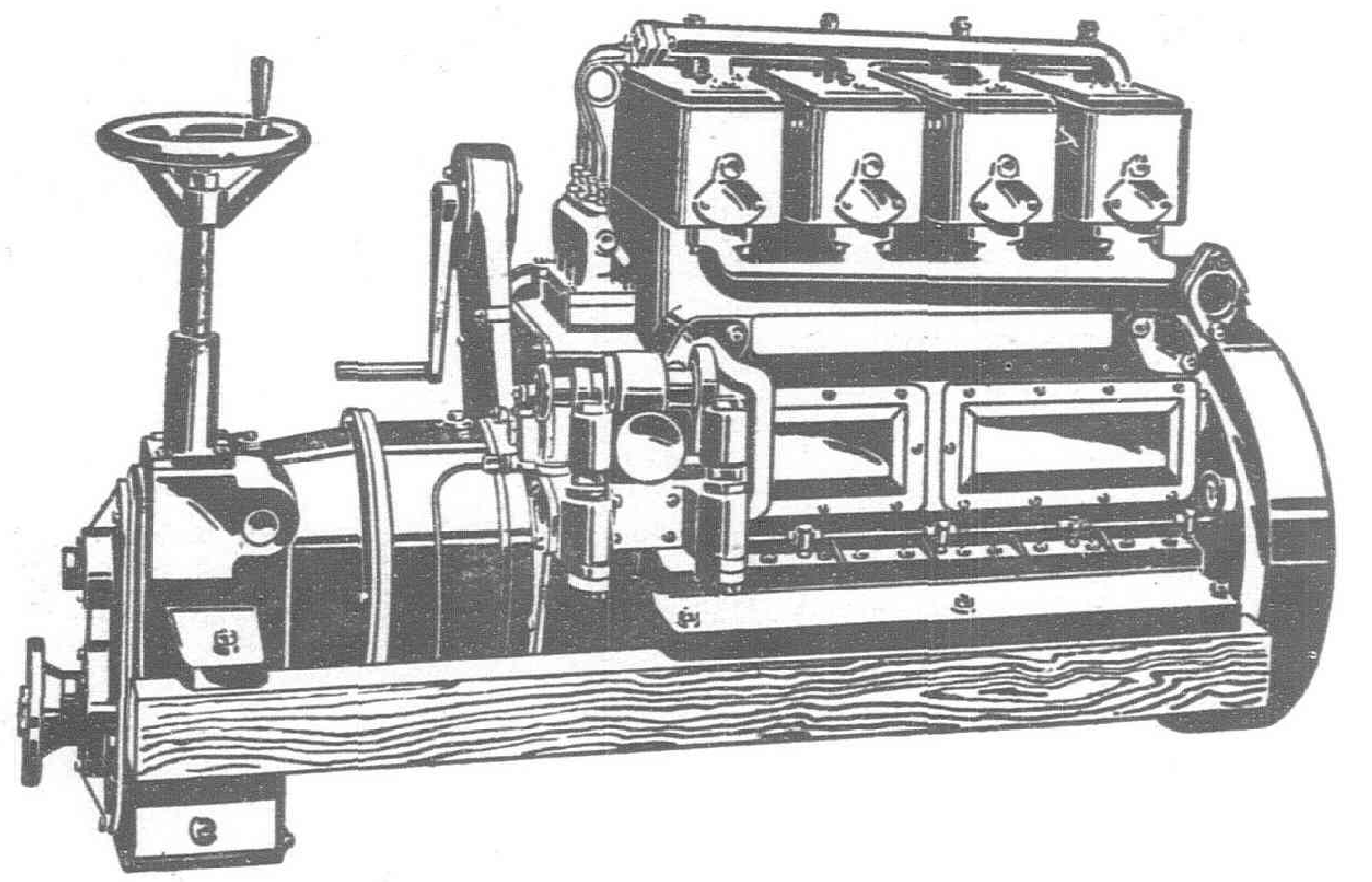

1, 2, 3, and 4 Cylinders

7 h.p. to 300 h.p. 600/1,000 r.p.m.

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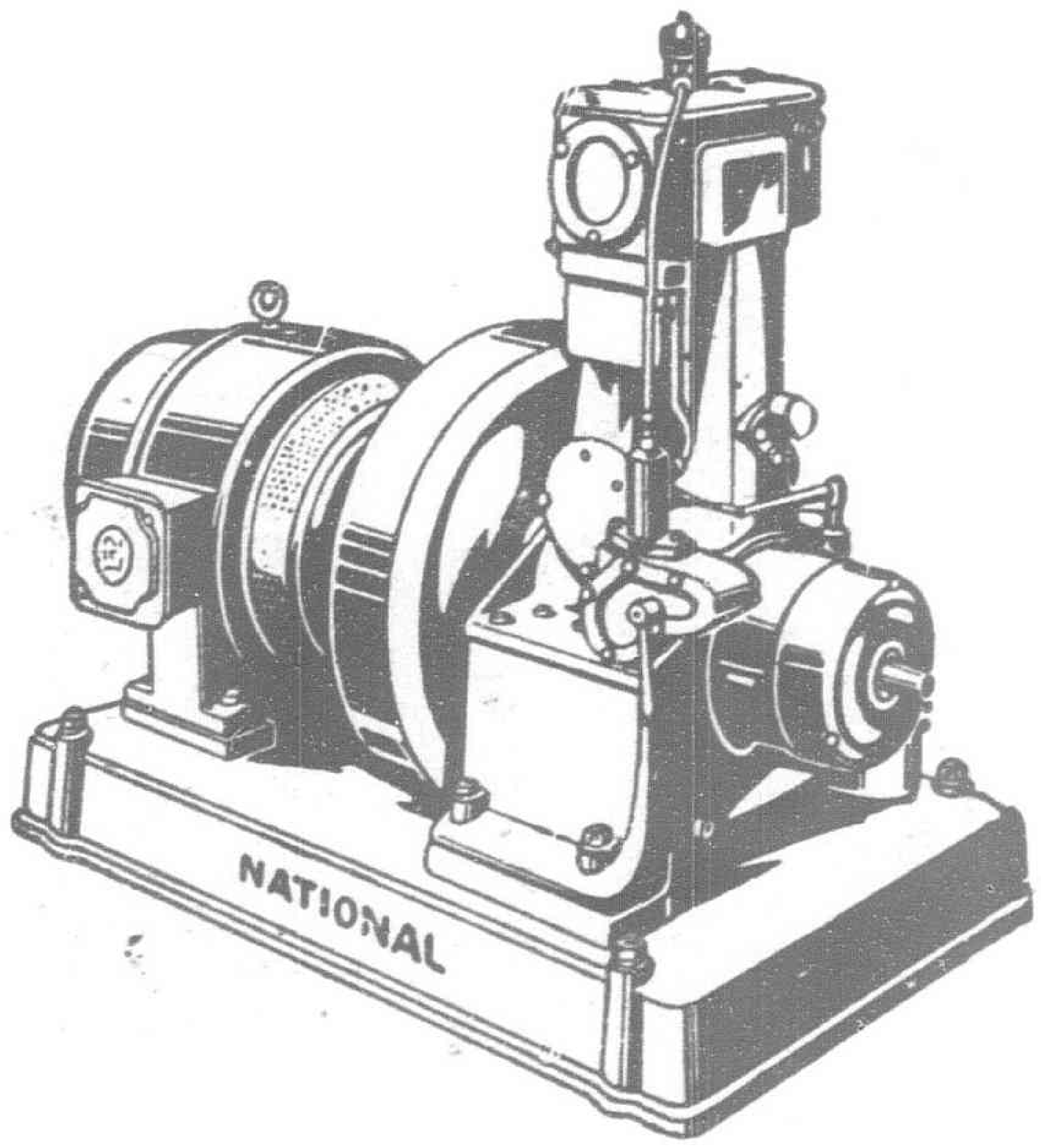
3 k.w. to 20 k.w. 800/1,000 r.p.m.

Instant starting from cold. No preheating.

Pressure lubrication to all bearings.

All working parts easily accessible.

Low lubricating oil and fuel consumption.



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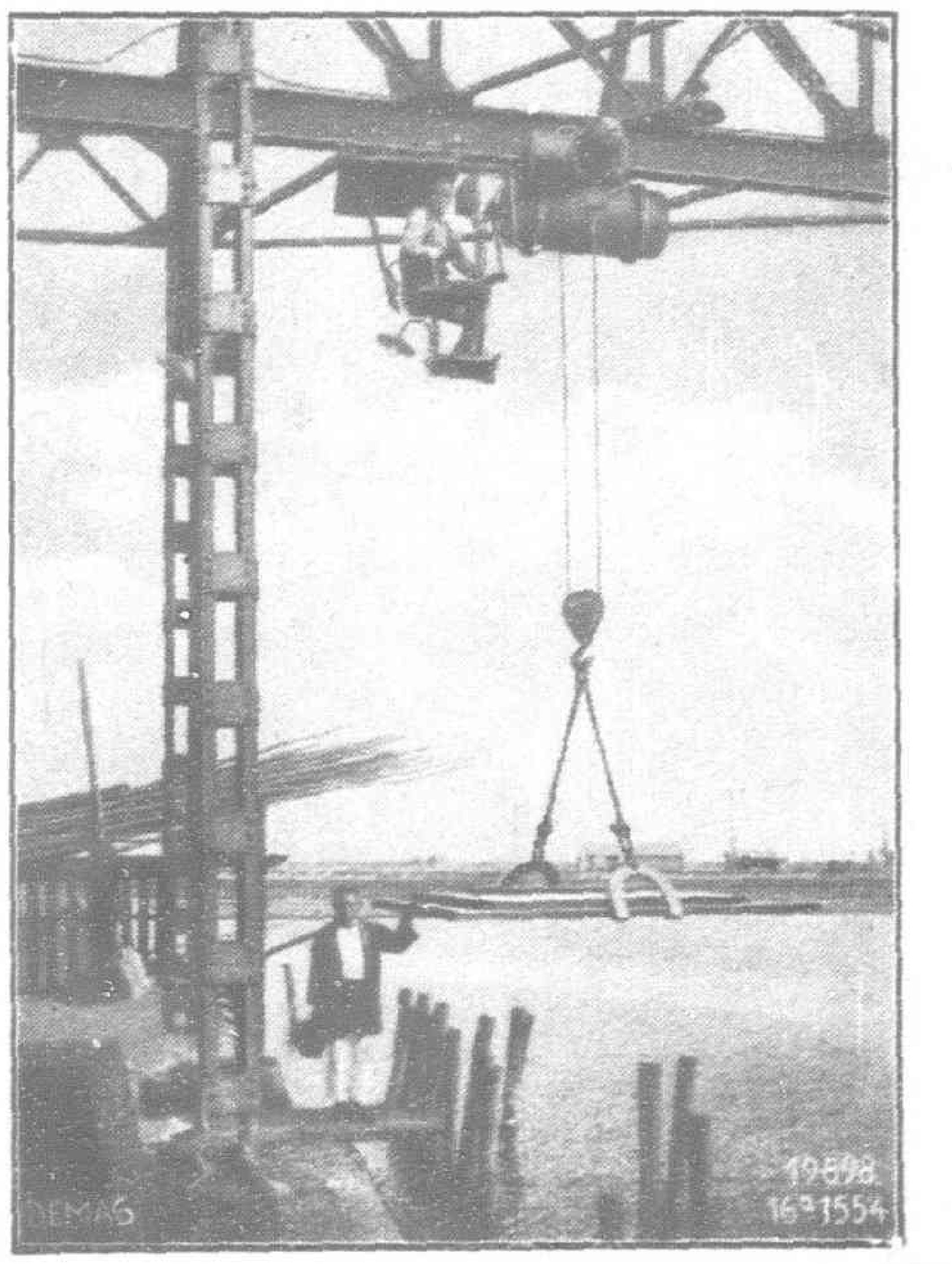

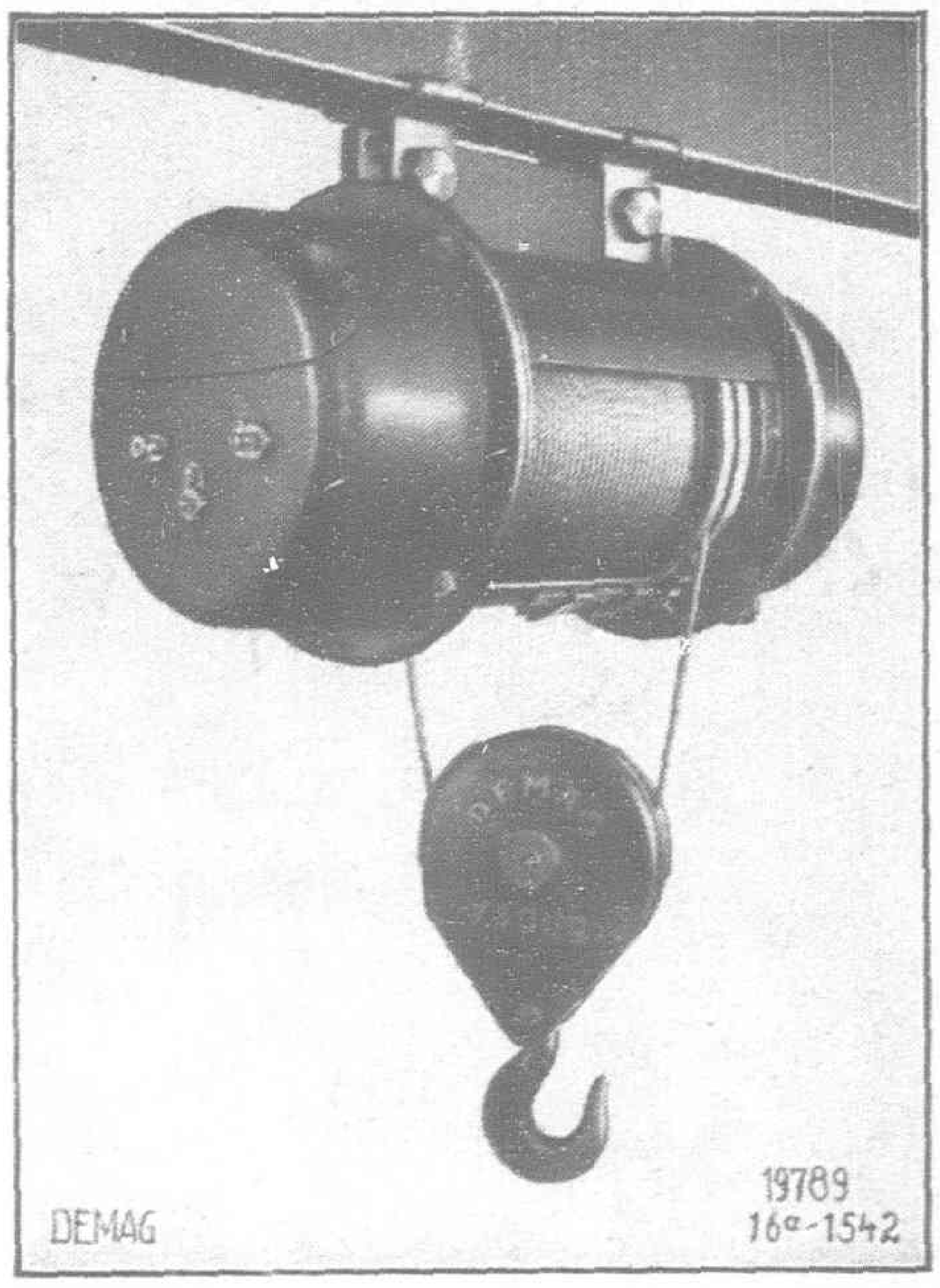

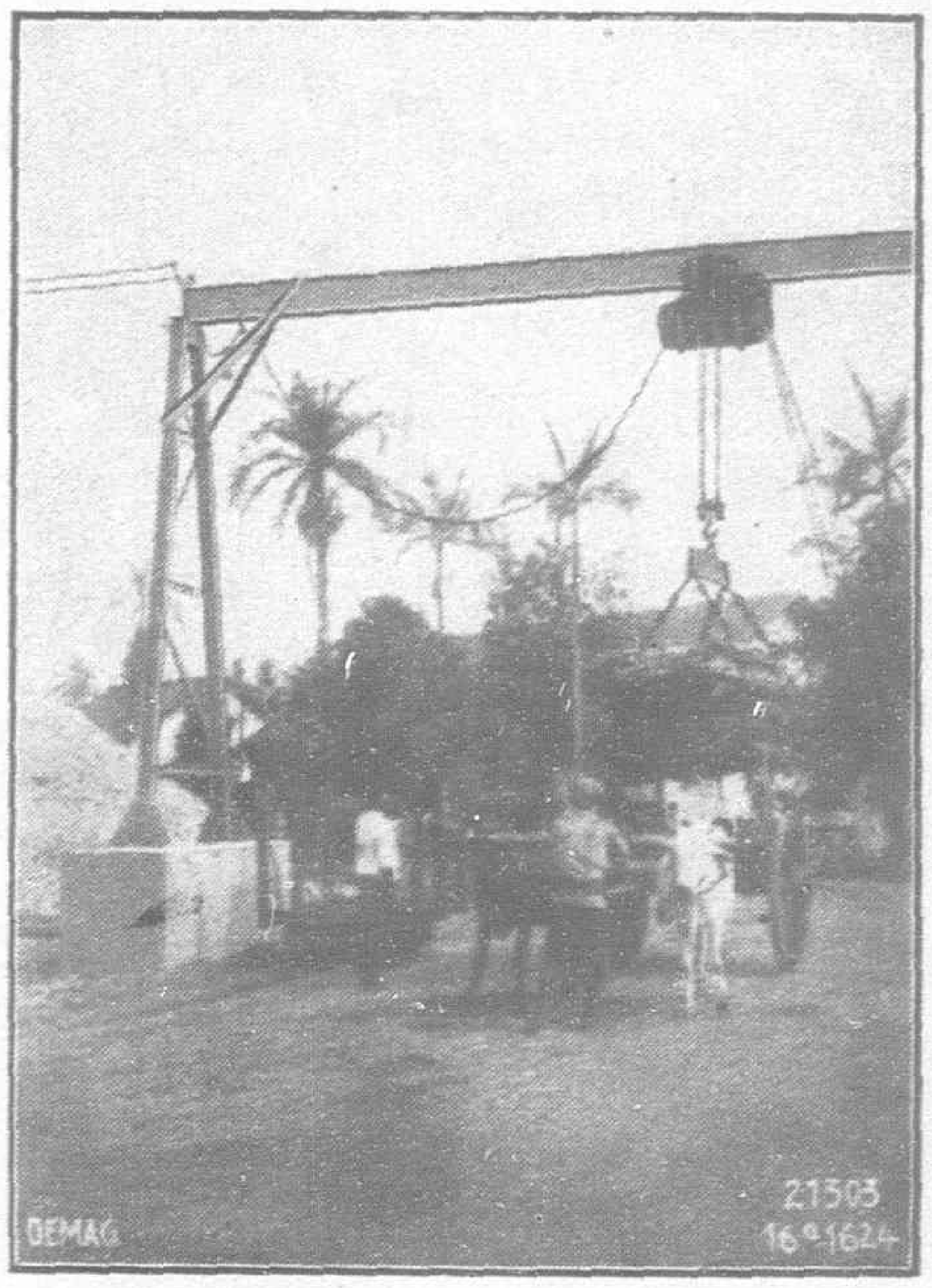

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Nowadays electrically driven, rapid working lifting appliances can no longer be dispensed with in industrial works. Especially type " K " of our world-wide renowned Demag Blocks implies: Quicker, easier and cheaper transporting work than has been attained hitherto. Demag Blocks are constructed either as stationary or portable units and are in operation by thousands in all industrial countries of the world.

Please write for our special literature and do not fail to apply for our expert advice.

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Japan—P. Schmitz & Co., Engineering Office, Nippon-Kaijo Building, OSAKA. Tatemono Building, TOKYO.
Dutch East Indies—N. V. Technisch Bureau v/h Kaumanns & Co. BANDOENG Bragaweg 75, DEN HAAG Javastraat 44
Straits Settlements—Dr. Ernst Poll, SINGAPORE, Raffles Hotel
Australia—(only for Demag Blocks and Hoists) T. Alexander Borthwick, Royal Exchange Building, Cr. Pitt and Bridge Streets, Sydney (for all other products) Henry Simms & Co., Kembla Buildings, Margaret Street, SYDNEY, N.S.W.
The Philippines—The Philippine Engineering Co., 936, Calle Raon, MANILA, P.I.
British India and Australia—(only for Steelworks and Rolling Mills) Duncan Stewart-Demag Corporation Ltd., 45 Victoria Street, LONDON, S.W.1.

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CONCRETE BREAKERS, MIXERS, DISINTEGRATORS, COKE BREAKERS, CRUSHING ROLLS, MORTAR MILLS, ELEVATORS,
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Complete Equipment for Textile Mills,
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COTTON, COTTON YARN, PIECE-GOODS, RAW SILK, WOOL, JUTE, RICE, RAYON AND GENERAL COMMISSION MERCHANTS

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Capital Paid-up - - - Yen 10,400,000.00

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Branches:

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Agencies and Correspondents:

Kobe, Nagoya, Tokyo, Seoul, Mokpo, Mukden, Hsinking, Tientsin, Tsinan, Changtien, Hongkong, Calcutta, Karachi, Soerabaja, Sydney, Mombasa, Alexandria, Liverpool, Bremen, Hamburg, Milan, New York, Dallas

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Raw and Refined—Fuji Brand Cube and Granulated

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13 Raw Sugar Mills in Formosa—Two Refineries on Mainland

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GRAND PRIZES
ASAHI BEER
DAI NIPPON BREWERY COMPANY LIMITED TOKYO, JAPAN
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SPECIALLY BREWED FOR EXPORT

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MEIJI SEITO KABUSHIKI KAISHA

(MEIJI SUGAR MANUFACTURING CO., LTD.)

Established 1906

HANJI SOMA, *President*

Authorized Capital - - Y.48,000,000
Paid-up Capital - - - Y.34,800,000

Headquarters:
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Tokyo Office:
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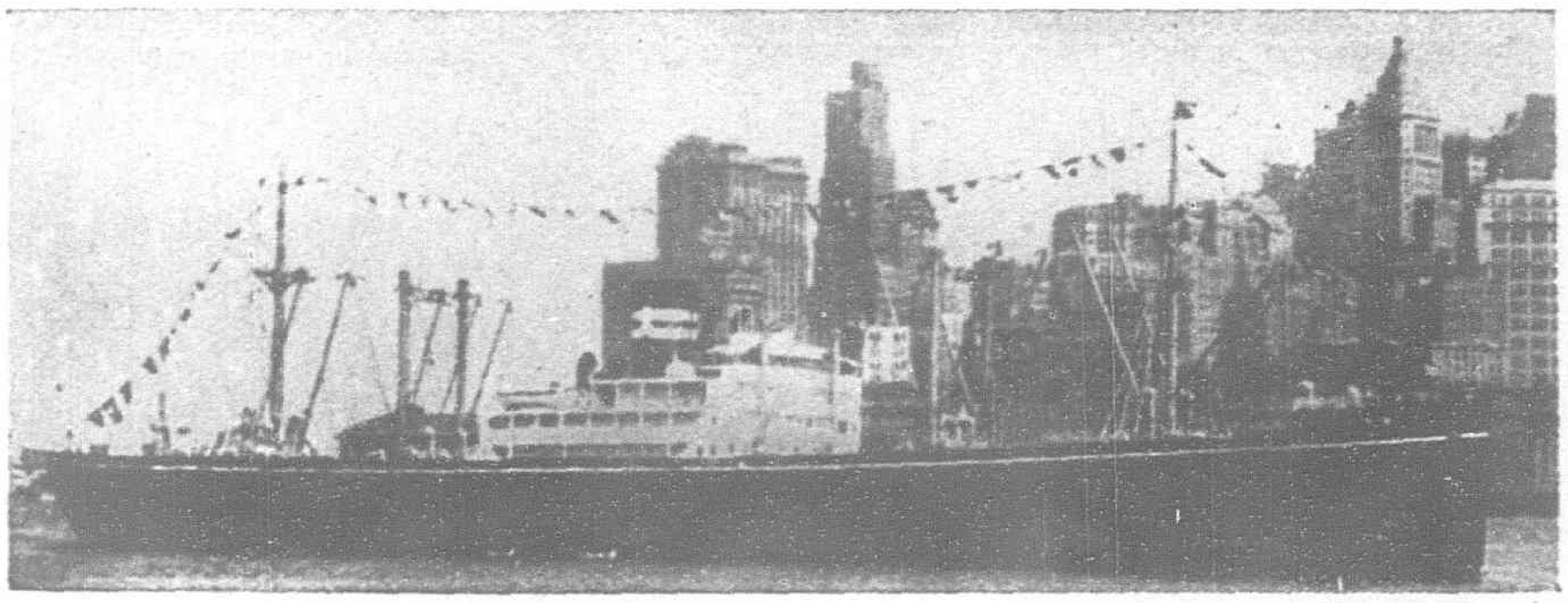
aggregating 550,000 Tons.



M.V. *Kinai Maru* One of Eight Sister Boats on the New York Express Freight Service

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New York, Philadelphia, Boston, Baltimore, Los Angeles and Panama Canal—Far East.
FORTNIGHTLY SERVICE

Shanghai—36 Days—New York. New York—41 Days—Shanghai

Shanghai to Foochow, Keelung, Takao, Tsingtao, Tientsin and Dairen
Every 10 Days Service

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South American Line -	- *Monthly*	Bombay Line -	- *2 times a Month*
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Australian Line -	- - *Monthly*	Saigon-Bangkok Line	*2 times a Month*
South Sea Line -	- *2 times a Month*	Philippine Line	- - *Fortnightly*

Chinese Service

Osaka-Dairen Line	- *Daily Sailing*	Keelung-Foochow-Amoy Line	*3 times a Month*
Osaka-Tientsin Line	- *7 times a Month*	Keelung-Hongkong Line	- *Weekly*
Yokohama-Tientsin Line	*6 times a Month*	Takao-Canton Line	- *Fortnightly*

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SHANGHAI, HONGKONG, SWATOW, AMOY, CANTON, FOOCHOW, HANKOW, TSINGTAO, CHEFOO AND DAIREN

Capital (Fully Paid):
Y.100,000,000

Reserve Funds (April 1934):
Y. 68,700,000

MITSUI BUSSAN KAISHA, LTD.

(MITSUI & CO., LTD., IN EUROPE AND AMERICA)

Established: 1876 **Cable Address: "MITSUI"**

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Head Office: TOKYO, JAPAN

PRINCIPAL LINES OF BUSINESS:

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Airplanes
Beer
Building Materials
Cotton Piece Goods
Camphor
Cement
Cereals, Flour, Rice, Wheat, Soya Beans, Maize, Etc.
Coal
Drugs and Chemicals
Dyestuffs
Fertilizers, Nitrate of Soda, Sulphate of Ammonia, Phosphate Rock, Bean Cake, Etc.
Ginseng
Hosiery
Jute, Gunnies, Hemp, Etc.
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Marine Products
Metals, Copper, Iron, Steel, White Metals, Etc.
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Rubber
Rayon, Rayon Piece Goods
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Soap
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Sugar
Tobacco
Tea
Wool, Tops, Woollen Yarns and Piece Goods, Etc.

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Paris and Lyon: Societe Anonyme Francaise Bussan.
Cape Town and Johannesburg: Mitsui Bussan South Africa (pty.) Ltd.
Buenos Aires: Jutaro Koma.

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TEIJIRO KAWAMURA, *Representative Director*
JIHEI INOUYE
SHIGEJI TAJIMA
TADAHARU MUKAI

Directors:
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B. MITSUI
K. FUKUI
B. TANAKA
T. HIRATA
T. MORIOKA
R. ISHIDA
K. SHIMADA

Auditors:
T. TAKEMURA
K. SEKO
T. MIKIMOTO
H. TSUDA
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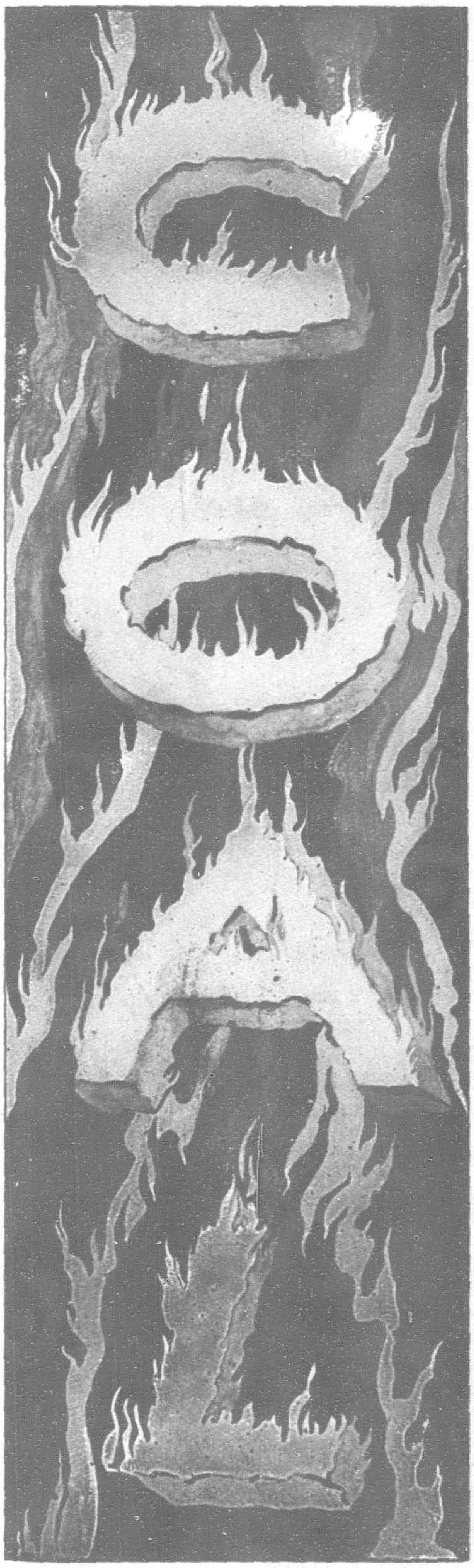
FUSHUN



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OUTPUT OF MINES, 8,200,000 TONS

Open Cut Mine, Fushun Colliery

A new coal pier handling 3,800,000 tons of coal for Export and Bunker Supply is now in operation at Kanchengtsu, across the bay from Dairen. Four 8,000 ton vessels can be accommodated at one time and loaded by boom conveyors at the rate of 900 tons per hour from each conveyor. A coal storage yard with a capacity of 3,000,000 tons guarantees quick dispatch.

Depots: Dairen, Port Arthur, Newchwang, Tientsin, Tsingtau, Tsurumi

Agencies: Chefoo, Manila, Batavia, South Seas, Moji, Takao (Formosa), Nagoya, Shanghai, Sourabaya, Singapore, Osaka, Hongkong, Penang, Yokohama, Niigata

Also Sulphate of Ammonia, Fire Clay, and Talc

Pamphlets and Particulars gratis from any of the above Depots and Agencies, and from the

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South Manchuria Railway Company, Dairen

Mitsubishi Marine and Fire Insurance Co., Ltd.

(Mitsubishi Kaijo Kasai Hoken Kabushiki Kaisha)

Head Office:	Cable Address:
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Capital - - - -	Yen 5,000,000
Reserve Fund - -	„ 12,380,000

Branches and Agencies:

LONDON, NEW YORK, OSAKA, KOBE, SHANGHAI, AND OTHER IMPORTANT CITIES AND PORTS OF THE WORLD

Mitsubishi Trust Co., Ltd.

Subscribed Capital - -	Yen 30,000,000
Paid-up Capital - - -	Yen 7,500,000

Chairman:
Mr. Kenkichi Kagami

Managing Directors:
Mr. Hidemi Tamura
Mr. Yasuichi Miyagawa

Head Office:
No. 6 Marunouchi, Nichome, Kojimachi-ku, Tokyo.

Branch Office:
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JAPANESE

TEXTILES FOR EXPORT

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Established 1889

Capital	**Y. 50,000,000**
Reserve & Brought For'd.	**Y. 46,017,000**

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of

All Sorts of Cotton Yarns and Cloths, Raw Silks and Spun Silks

Head Office

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OSAKA

President

Dr. K. KIKUCHI

Factories:

Fifteen Mills at Home and
Two Mills in China

Number of Spindles:	Cotton Yarn	993,700
	Silk Yarn	47,500
Number of Weaving Machines:		9,100

NAIGAI WATA KAISHA, LIMITED

Established 1887

Capital	**Y. 33,000,000**
Capital Paid-Up	**Y. 24,500,000**
Reserve Fund	**Y. 18,043,000**

MANUFACTURERS

OF

COTTON, YARNS, Grey and Gassed

COTTON PIECE GOODS, Grey, White, Dyed and Printed

Head Office

Dojima-Kitamachi, Kitaku, OSAKA

Factories in

Osaka, Nishinomiya and Nagoya, Japan; Shanghai and Tsingtao, China; Chinchou, South Manchuria

Total Plant Capacity

Number of Spindles:	524,180
Number of Doublers:	120,080
Number of Looms:	4,604
Dyeing and Finishing Plant:	2 works

JAPANESE

TEXTILES FOR EXPORT

Kanegafuchi Spinning Co., Ltd.

CAPITAL AUTHORIZED . Y.60,000,000
CAPITAL PAID-UP - - Y.39,063,825
RESERVES AND FUNDS Y.53,417,130

President TSUDA SHINGO

Head Office - - - - TOKYO
Business Headquarters KOBE

Manufacturers of

ALL KINDS OF YARN AND FABRICS OF COTTON, SPUN SILK, PURE SILK, ETC. AND ALSO DYER, BLEACHER, PRINTER AND FINISHER OF THESE FABRICS. FULL FASHIONED SILK HOSIERY, ETC. WOOL AND WOOLLEN FABRICS, ETC.

Artificial Silk Plants
Under Construction

Its Affiliated Company, "Kanebo Service Company, Ltd.," has solely its aim to extend service and facilities for the common interest of the customers in dealing with the said manufactured goods.

Fuji Gassed Spinning Company, Ltd.

(Fuji Gasu Boseki Kabushiki Kaisha)

Capital: Yen 38,000,000

STANDARD PRINTED
and
DYED COTTON and
SILK FABRICS

SHIRTINGS
PRINTS
DAMASKS
PONGEES
CREPES
SHEETINGS
CRETONNES
TOWELLING
ETC. ETC.
BROCADES
SILKS
DRILLS
FLANNELETTES
CREPES
SATINS

Head Office:
GOCHOME, OSHIMA-MACHI, NEAR TOKYO
Cable Address "FUHO"
Business Office:
SAKAMOTOCHO, NIHONBASHI-KU, TOKYO

JAPANESE

TEXTILES FOR EXPORT

TOYO BOSEKI KAISHA

Manufacturers of

COTTON YARN; SHEETINGS, SHIRTINGS,
T-CLOTHS, DRILLS, JEANS, SATINS;
WHITE, DYED and PRINTED; SPUN SILK.

Head Office: DOJIMA HAMAORI, OSAKA.

President: FUSAJIRO ABE

FUKUSHIMA BOSEKI KABUSHIKI KAISHA

Established 1892

Capital... ... ...Yen 8,000,000
Capital Paid-up... „ 5,600,000
Reserve ... ... „ 12,491,045

Manufacturers of Cotton Thread and Cotton Cloth, T-Cloth, Drill and Cotton Shirtings

Head Office: Nichome, Tamayecho, Kitaku, Osaka, Japan

President: YUTARO YASHIRO

KURASHIKI BOSEKI KABUSHIKI KAISHA

Established 1887

Capital... ... ...Yen 17,200,000
Capital Paid-up... „ 12,350,000
Reserve ... ... „ 6,800,000

Cotton Spinners and Weavers

Head Office: Kurashiki, Kurashiki-shi, Okayama, Japan

President: MAGOSABURO OHARA

NISSHIN BOSEKI KABUSHIKI KAISHA

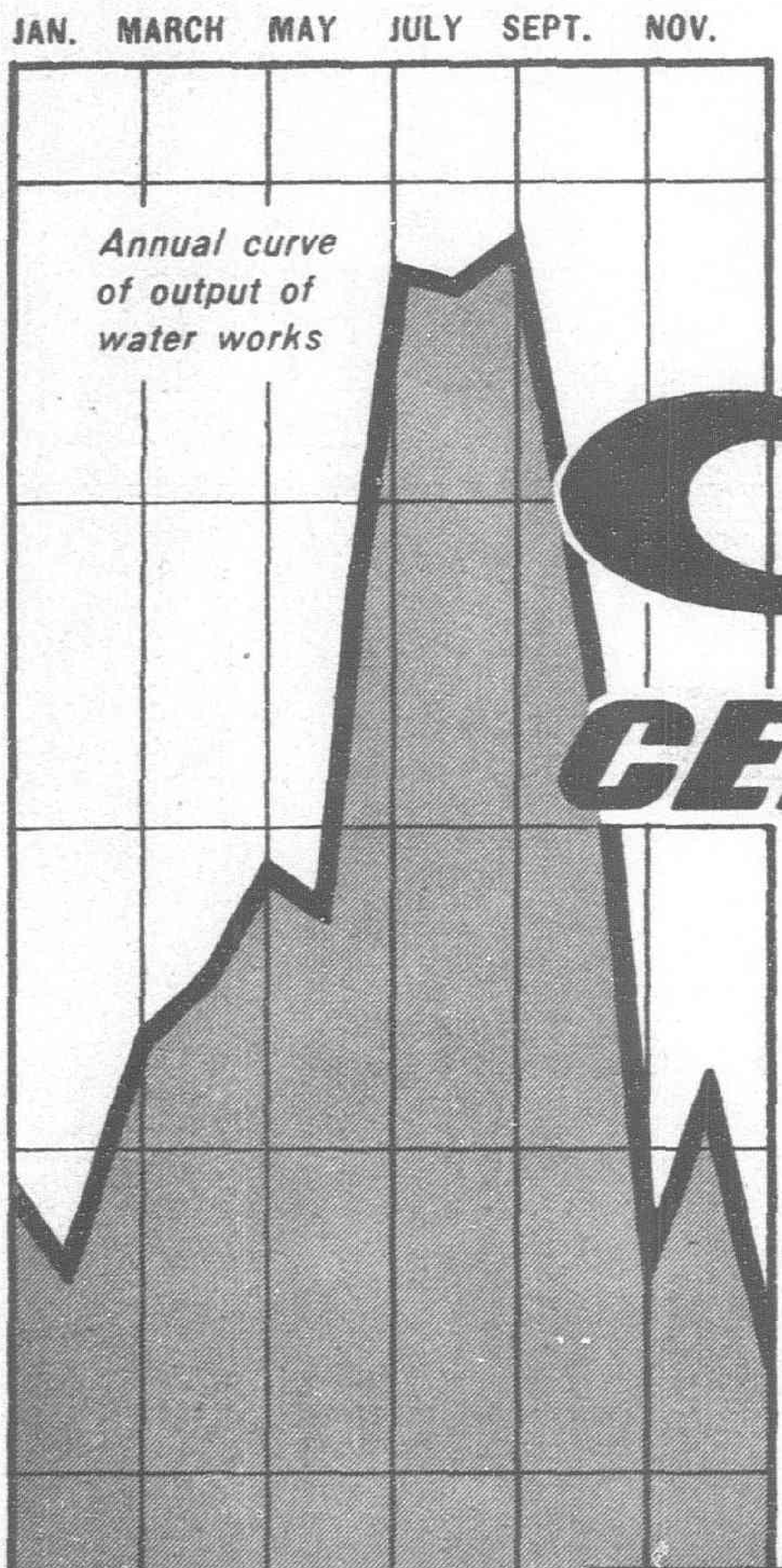
Established 1907

Capital... ... ...Yen 27,000,000
Capital Paid-up... „ 16,125,000
Reserve ... ... „ 4,880,594

Manufacturers of Cotton Yarn, Cloth and Shirtings

Head Office: Kameido-machi, Minami-katsushikagori, Tokyofu, Japan

President: SEIJIRO MIYAJIMA

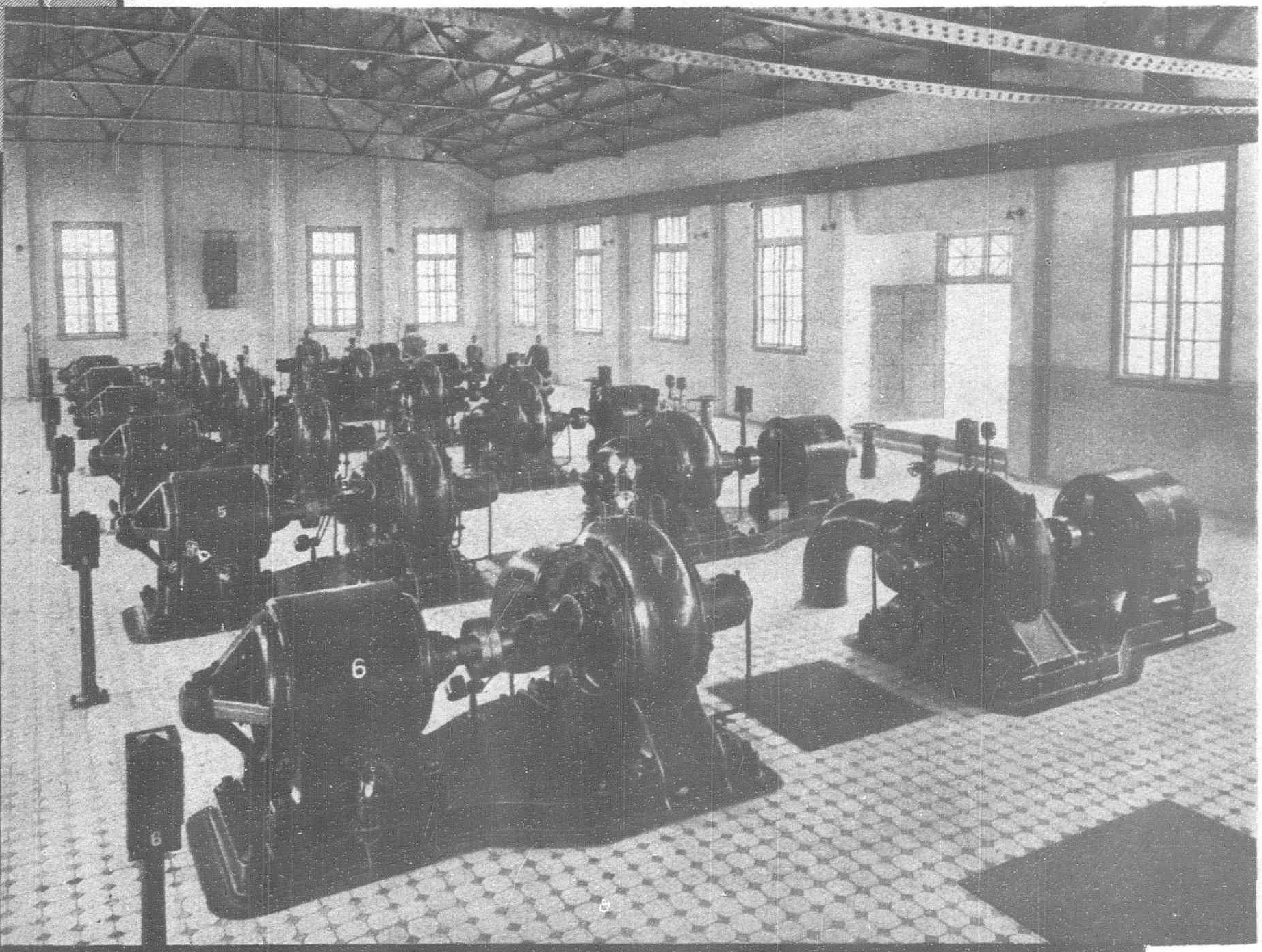


Sulzer

CENTRIFUGAL PUMPS

LOW, MEDIUM AND HIGH-LIFT PUMPS
BOREHOLE PUMPS

Waterworks with Sulzer pumps suitable for fluctuating demands



Osaka Municipal Waterworks, delivering a total of 45,500 gals. per minute

SULZER BROTHERS, LIMITED, WINTERTHUR (SWITZERLAND)

***SHANGHAI:** SULZER BROTHERS*
Engineering Office - 34 Avenue Edward VII

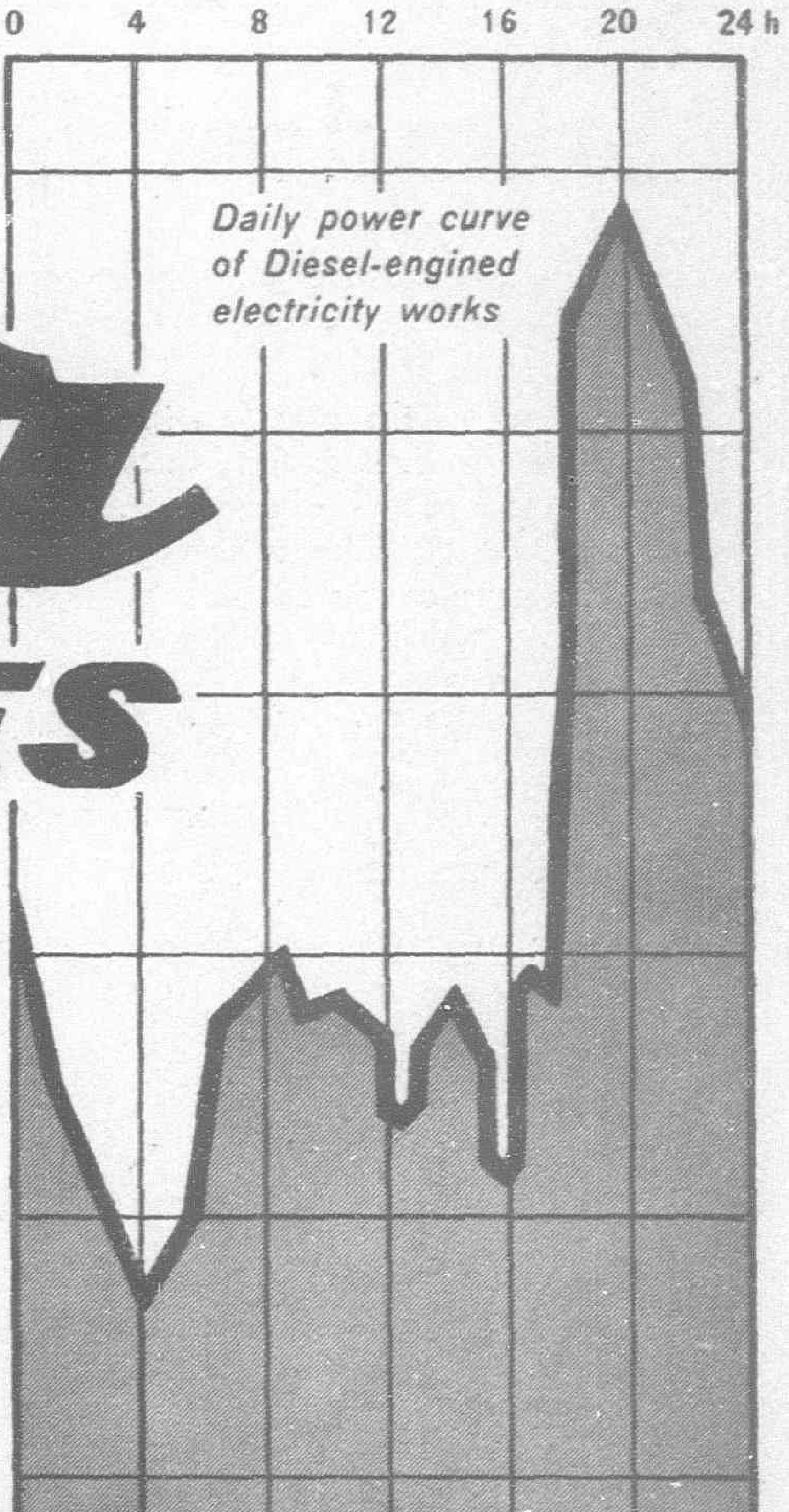
***KOBE:** SULZER BROTHERS*
Engineering Office - 72 Kyo-Machi

Sulzer

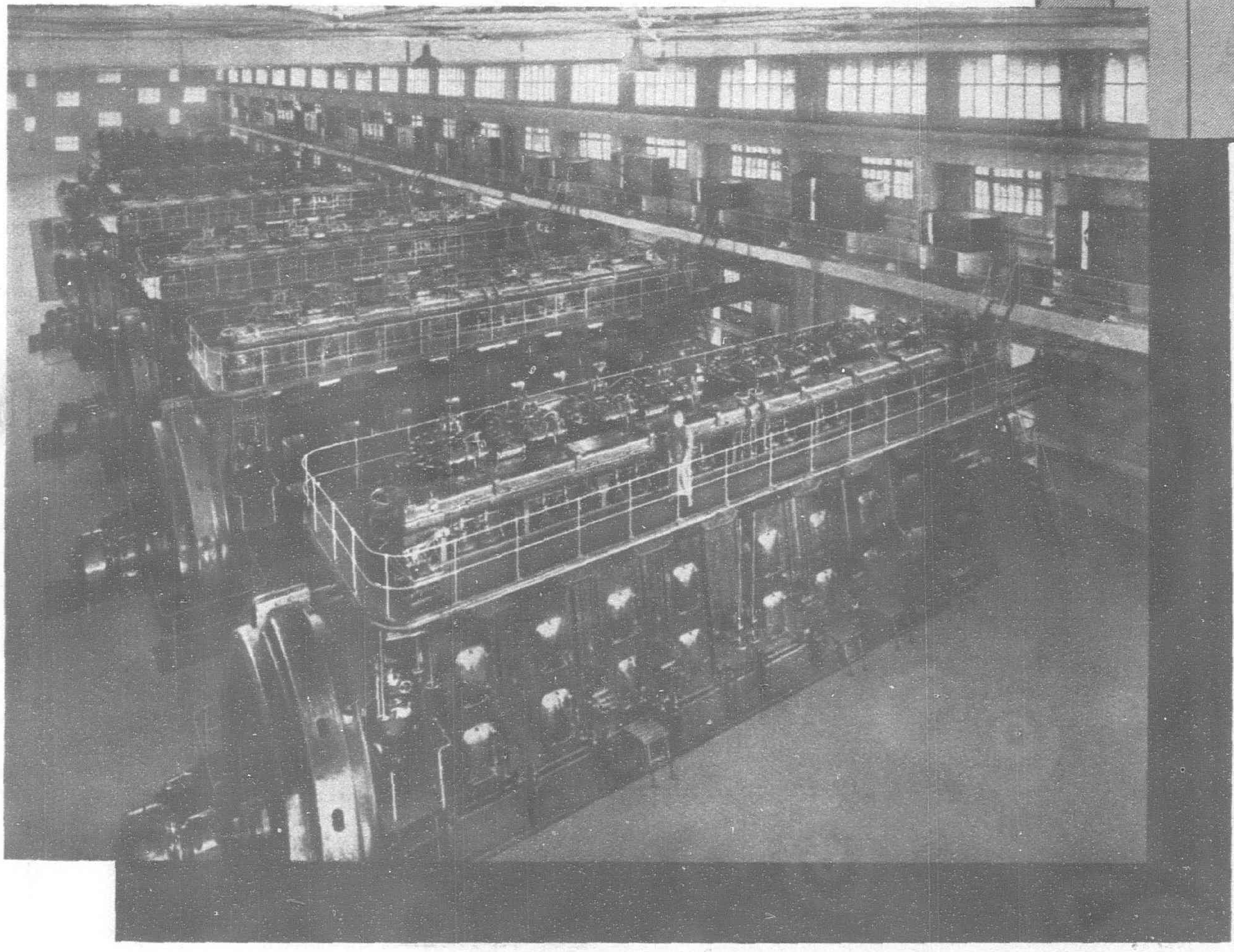
DIESEL ENGINES

TWO-CYCLE (SINGLE AND DOUBLE-ACTING)
FOUR-CYCLE

Electricity works with Sulzer Diesel engines for light and power



Daily power curve of Diesel-engined electricity works



Diesel-engined power station Shanghai, 50,000 B. H. P. max. output

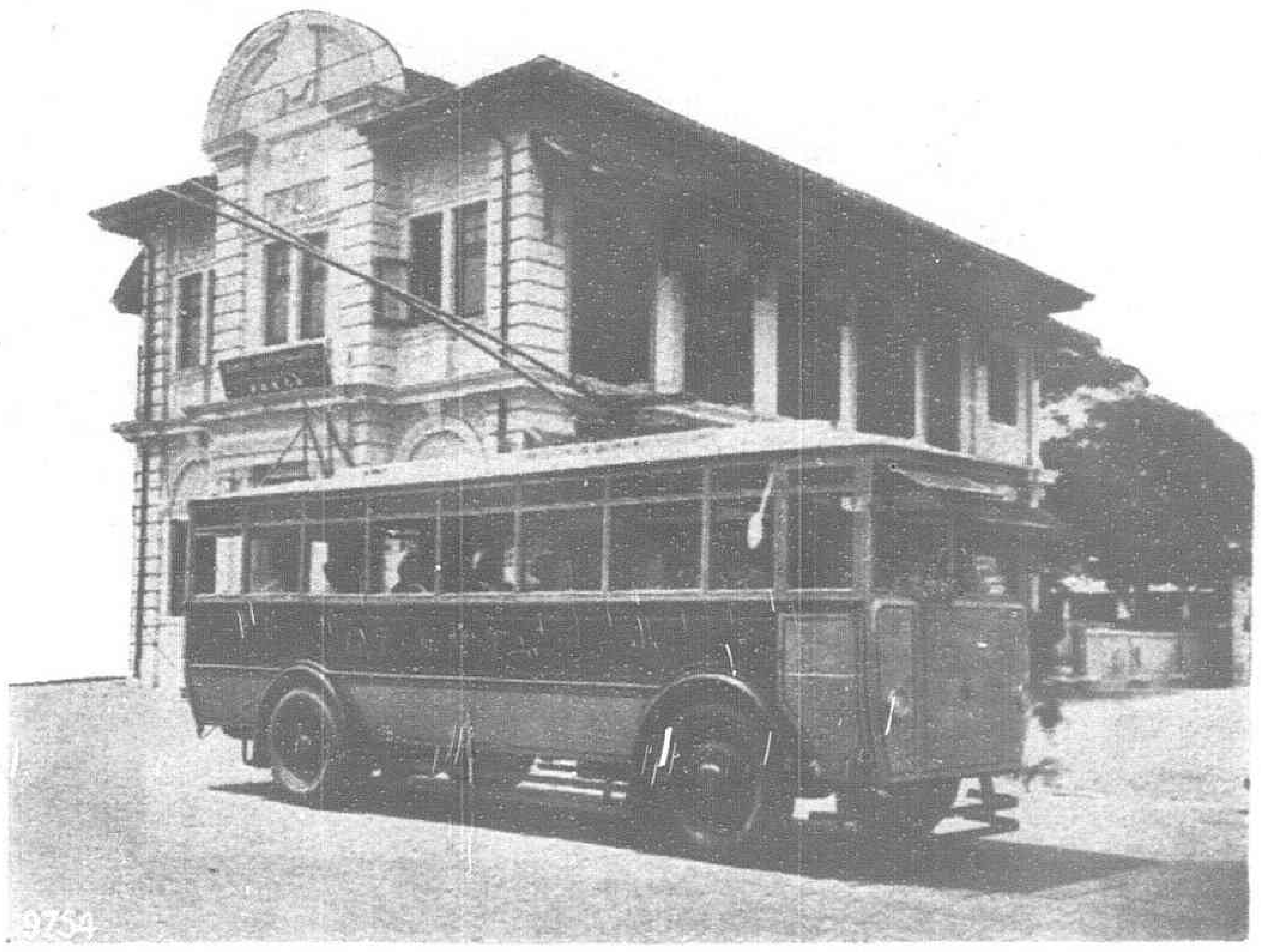
SULZER BROTHERS, LIMITED, WINTERTHUR (SWITZERLAND)

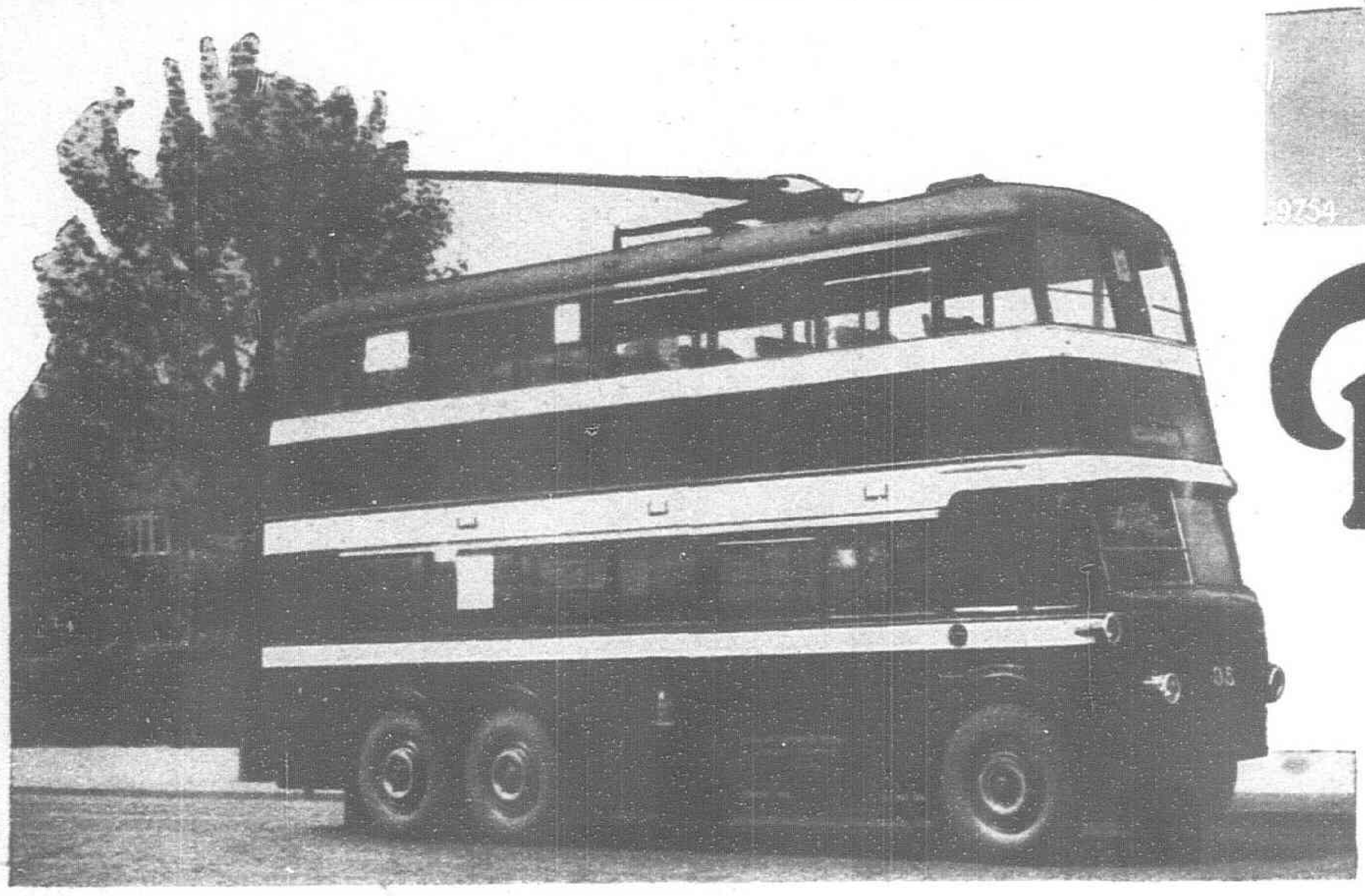
SHANGHAI: SULZER BROTHERS
Engineering Office - 34 Avenue Edward VII

KOBE: SULZER BROTHERS
Engineering Office - 72 Kyo-Machi

Soundest in design and construction

Constant study of the problems involved and the regular development of improved features have enabled us to maintain our leading position among makers of modern trolley buses. Reduced running and maintenance costs, exceptional ease of adjustment and operation, and immunity from many of the troubles common to most buses are direct results of our research work.





Ransomes

—ELECTRIC TROLLEY BUSES—

USERS INCLUDE:

Rotherham
Chesterfield
Huddersfield
Darlington
Ipswich
Derby
Liege
Penang
Poznan
Medellin
Christchurch
Bloemfontein
Nottingham
Maidstone
Tees-side
St. Helens

RANSOMES, SIMS & JEFFERIES, LTD.,

Orwell Works, Ipswich, England.

ATTWATER & SONS

ESTABLISHED 1868

Hopwood Street Mills, PRESTON, ENGLAND

MICA and MICANITE

IN ALL FORMS AND QUALITIES.

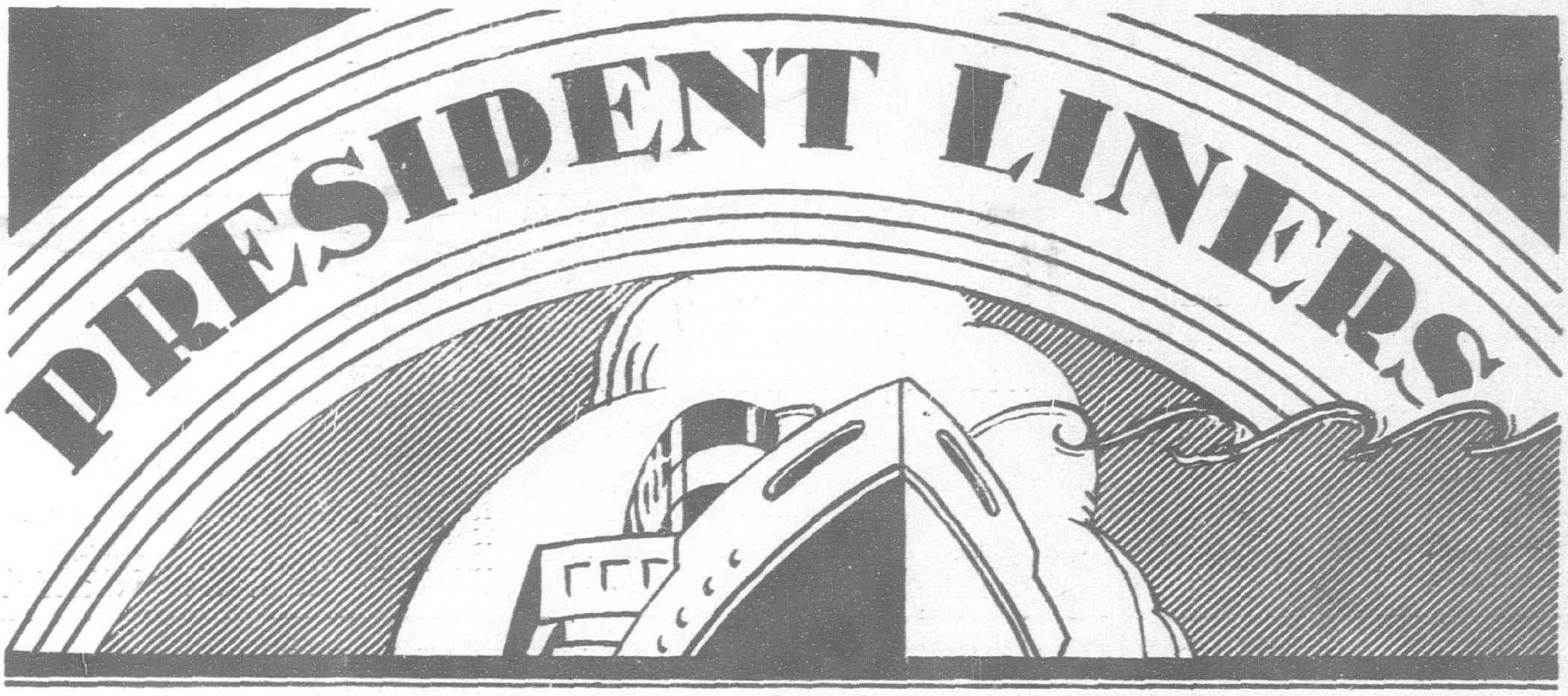
BAKELITE SHEETS, TUBES, BOBBINS, VARNISH and RESIN for OIL SWITCH GEAR and TRANSFORMERS. VULCANISED FIBRE, SHEETS, TUBES and RODS. PEERLESS LEATHEROID INSULATION EMPIRE CLOTH and TAPES. COTTON and also ASBESTOS DYNAMO TAPES.

PRESSPAHN AND FULLERBOARD IN SHEET AND ROLLS

WHILE I LIVE I'LL CROW

REGD TRADE MARK

EBONITE AND ALL INSULATING MATERIAL FOR ELECTRICAL ENGINEERS



To EUROPE . . . .

via AMERICA . . . .

PRESIDENT Liners offer a varied selection of services enabling you to select the route you desire, either first or special class. THE SUNSHINE ROUTE—via Japan, Hawaii, California, the Panama Canal, Cuba, New York, or ACROSS AMERICA—using any one of the 12 trans-continental rail lines, each offering their different points of interest—then from the Atlantic Seaboard, your choice of any trans-Atlantic steamer, either first or cabin class. THE EXPRESS ROUTE—via Japan direct to Seattle, either first or special class, and your choice of rail routes across America—and then through to Europe on any Atlantic steamer you choose, either first or cabin class. To lend variety to your trip, you have the option of going by one route and returning by another. President Liners offer you real travel economy, with all that their reputation implies— luxurious comfort, excellence of cuisine, courtesy, service, entertainment. Ask for complete particulars concerning our special reduced fares.

FARES
ONE WAY
First Class as low as £95
Special and Cabin Class as low as £65
ROUND TRIP
First Class as low as £172
Special and Cabin Class as low as £128

Hongkong and Shanghai Banking Corporation

(INCORPORATED IN HONGKONG)

Capital: Authorised Capital $50,000,000
Issued and fully paid-up .. $20,000,000

Reserve Funds: Sterling £6,500,000
Silver $10,000,000
Reserve Liability of Proprietors $20,000,000

Board of Directors

Hon. Mr. C. G. S. MACKIE, Chairman
S. H. DODWELL, Esq. Deputy Chairman
Hon. Mr. W. H. BELL
A. H. COMPTON, Esq.
W. J. KESWICK, Esq.
C. C. KNIGHT, Esq.
G. MISKIN, Esq.
K. S. MORRISON, Esq.
T. E. PEARCE, Esq.

Head Office:
HONGKONG

Chief Manager:
V. M. GRAYBURN, Esq., Hongkong

London Branch:
9 Gracechurch Street, E.C.3

Shanghai Branch: 12 The Bund
Sub-Agency: 27 Broadway

Branches and Agencies:

AMOY
BANGKOK
BATAVIA
BOMBAY
CALCUTTA
CANTON
CHEFOO
COLOMBO
DAIREN
FOOCHOW
HAIPHONG
HAMBURG
HANKOW
HARBIN
ILOILO
IPOH
JOHORE
KOBE
KOWLOON (Hongkong)
KUALA LUMPUR
LONDON
LYONS
MALACCA
MANILA
MOUKDEN
MUAR(Johore)
NEW YORK
PEIPING
PENANG
RANGOON
SAIGON
S. FRANCISCO
SHANGHAI
SINGAPORE
SOURABAYA
SUNGEIPATANI
TIENTSIN
TOKYO
TSINGTAO
YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted. Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America. Safe Deposit Boxes to rent. Terms on application.

SAVINGS BANK OFFICE

Accounts will be kept in Dollars Local Currency.
Deposits of less than $1 will not be received.
Not more than $200 will be received during one month from any single Depositor.
Interest at the rate of 2½% per annum will be allowed upon the monthly minimum balance.
The maximum balance on which interest will be allowed is $5,000.
Deposits may be withdrawn on Demand.
Depositors will be provided with Pass Books in which all transactions will be entered. Pass Books must be presented when paying in or withdrawing money.

Office Hours—10 a.m. to 3 p.m. Saturdays 10 a.m. to Noon.

A. S. HENCHMAN, *Manager.*

The Kawasaki-One Hundredth Bank, Ltd.

HEAD OFFICE: YOROZU-CHO, TOKYO

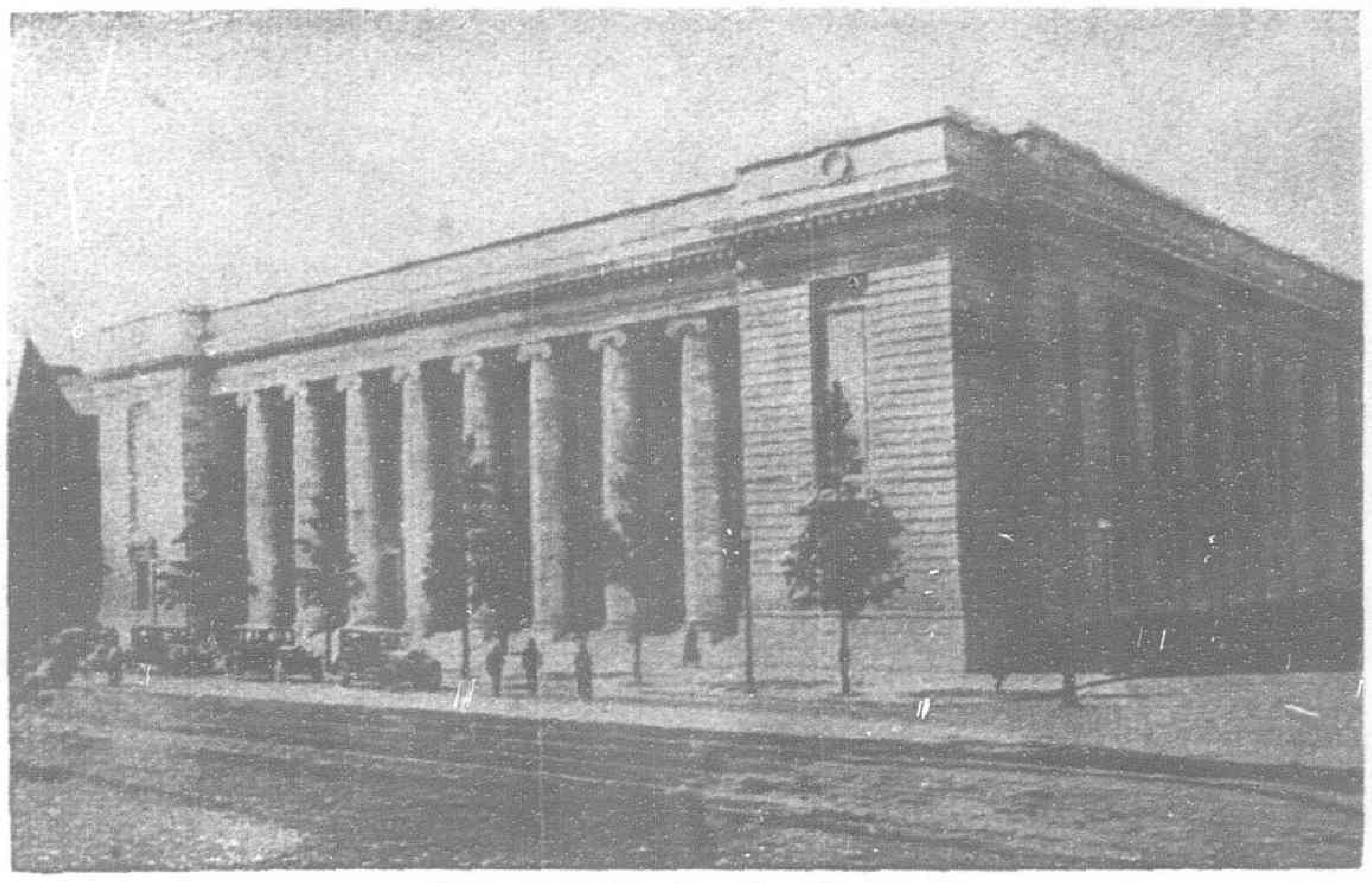
Phone: Nihombashi 141, 3105

SHO HOSHINO, *President*

Special facilities offered for foreign residents and corporations in Japan
Interest allowed on current and time deposits. Safe deposit box rented

BRANCHES AND AGENCIES:

Yokohama, Kobe, Kyoto, Osaka and 78 others in principal cities in Japan



Mitsubishi Bank, Tokyo

THE MITSUBISHI BANK,
LIMITED

CAPITAL SUBSCRIBED - Yen 100,000,000
CAPITAL PAID-UP - - Yen 62,500,000

CHAIRMAN:

Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Kiyoshi Sejimo Mr. Takeo Kato
Mr. Sobun Yamamuro

HEAD OFFICE:

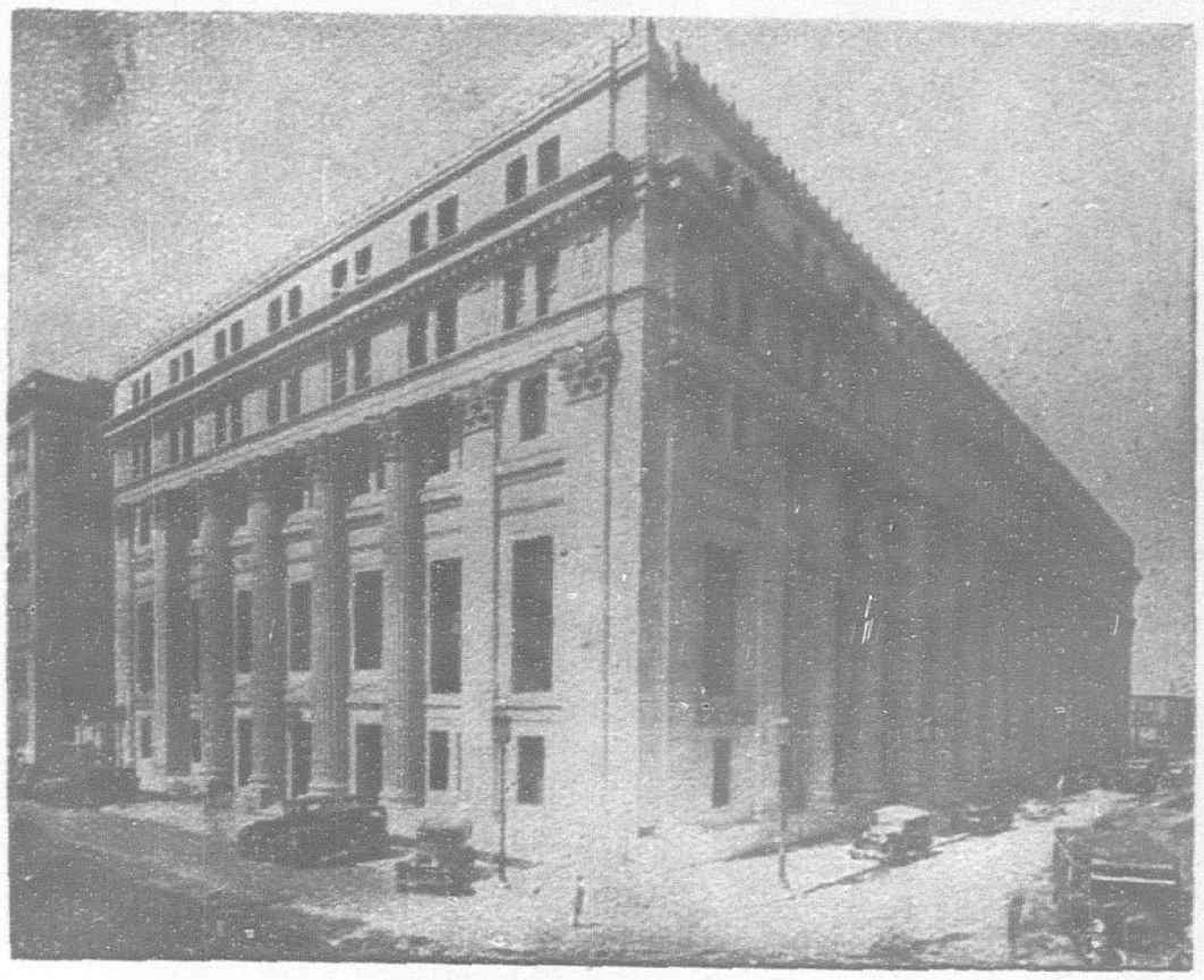
No. 5, Marunouchi, Nichome, Kojimachi-ku,
Tokyo.

BRANCHES HOME:

Eitaibashi (Tokyo), Tokio Kaijo Building (Tokyo), Marunouchi Building (Tokyo), Nihonbashi (Tokyo), Yotsuya (Tokyo), Komagome (Tokyo), Nihonbashi-Toricho (Tokyo), Kanda (Tokyo), Shinagawa (Tokyo), Omori (Tokyo), Osaka, Nakanoshima (Osaka), Senba (Osaka), Nishinagahori (Osaka), Kobe, Sannomiya (Kobe), Kyoto, Nagoya, Otaru.

BRANCHES OVERSEAS:

Shanghai Office : No. 2, Kiukiang Road, Shanghai.
London Office : No. 3, Birchin Lane, Cornhill, London, E.C.3.
New York Office : No. 120, Broadway, New York.



Mitsui Bank, Tokyo

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673

Capital Subscribed................Y.	100,000,000
Capital Paid-Up....................Y.	60,000,000
Reserve Funds........................Y.	54,800,000

HEAD OFFICE: TOKYO

No. 1 Muromachi 2-Chome, Nihonbashi-ku

Home Branches:

FUKUOKA, HIROSHIMA, KOBE, KYOTO, MARUNOUCHI (Tokyo), MOJI, NAGOYA, NAGOYA - KAMIMAETSU, NIHONBASHI (Tokyo), OSAKA, OSAKA - DOJIMA, OSAKA - KAWAGUCHI, OSAKA - NISHI, OSAKA - SEMBA, OTARU, WAKAMATSU (Kyushu), YOKOHAMA.

Foreign Branches:

Bombay, London, New York, Shanghai, Sourabaya.

London Bankers:

Barclays Bank, Ltd. Midland Bank, Ltd.

New York Bankers:

Bankers Trust Co. Chase National Bank.
National City Bank of New York.

PAID-UP CAPITAL YEN 150,000,000

THE SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

A Holding Company for Business and Industrial Enterprises of the Sumitomo Interests and Owners of Silver and Gold Mines, Forestlands, Etc.

OFFICES AND DEPARTMENTS

Mining Offices ... ... Konomai & Ohgayu
Forestry Department ... ... Osaka
Sales Departments... ... Tokyo, Yokosuka, Nagoya, Kobe, Kure, Hakata, Keijo and Shanghai

The Sumitomo Steel Works, Limited
OSAKA, JAPAN
Subscribed Capital: Yen 15,000,000

The Sumitomo Electric Wire & Cable Works, Ltd.
OSAKA, JAPAN
Subscribed Capital: Yen 15,000,000

The Sumitomo Steel Tube & Copper Works, Ltd.
OSAKA, JAPAN
Subscribed Capital: Yen 15,000,000

The Sumitomo Chemical Co., Limited
Subscribed Capital: Yen 20,000,000
Head Office: Osaka, Japan Works: Niihama, Iyo, Japan

The Sumitomo Besshi Mine, Limited
Paid-up Capital: Yen 15,000,000
Head Office: Niihama, Iyo, Japan Branch: Osaka, Japan

The Sumitomo Warehouse Company, Limited
Paid-up Capital: Yen 15,000,000
Head Office: Osaka, Japan Branches: Osaka, Kobe & Tokyo, Japan

The Sumitomo Trust Company, Limited
Subscribed Capital: Yen 20,000,000
Head Office: Osaka, Japan Branches: Tokyo & Fukuoka, Japan

The Sumitomo Life Insurance Company, Limited
OSAKA, JAPAN
Subscribed Capital: Yen 1,500,000

The Sumitomo Collieries, Limited
Paid-up Capital: Yen 12,000,000
Head Office: Osaka, Japan Branches: Wakamatsu & Otaru, Japan

ESTABLISHED: 1895 INCORPORATED: 1912

THE SUMITOMO BANK, LTD.

OSAKA, JAPAN

Subscribed Capital .. .. **Yen 70,000,000** **Paid-up Capital** .. .. **Yen 50,000,000**
Reserve Funds .. .. **Yen 37,860,000**

DIRECTORS:

N. YATSUSHIRO, Esq.	Chairman, Board of Directors and Chief Managing Director
K. OHDAIRA, Esq.	Managing Director
H. OKAHASHI, Esq.	,, ,,
K. OHSHIMA, Esq.	,, ,,
M. SOGAME, Esq.	,, ,,
BARON K. SUMITOMO	Director
K. HORI, Esq.	,,
M. OGURA, Esq.	,,
S. IMAMURA, Esq.	,,

Home Branches: Osaka, Tokyo, Yokohama, Nagoya, Kyoto, Kobe, Wakayama, Okayama, Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Kokura, Wakamatsu, Fukuoka, Kurume, Kumamoto.

Offices in Pacific Liners: M. S. "Asama Maru," M. S. "Chichibu Maru," M. S. "Tatsuta Maru."

Foreign Branches: London, New York, San Francisco, Los Angeles, and Shanghai.

Affiliated Banks: The Sumitomo Bank of Hawaii, Honolulu. The Sumitomo Bank of Seattle, Seattle. The Sumitomo Bank of California, Sacramento, Cal.

Correspondents: Established in all important places at home and abroad.

The Bank buys, sells and receives for collection Drafts and Telegraphic Transfers; issues Commercial and Travellers' Letters of Credit available in all important parts of the world, and acts as Trustee for Mortgage Bonds, besides doing General Banking Business.

The Bank of Chosen

Capital Subscribed - - - Yen 40,000,000
Capital Paid-up - - - - Yen 25,000,000

Governor: K. Katoh, Esq.
Directors:
J. Matsubara, Esq. M. Irobe, Esq.
Y. Matsuda, Esq.

Head Office: Keijo (Seoul) (Korea)

FOREIGN DEPARTMENT (TOKYO)

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

Branch Offices:

Japan Proper—Tokyo, Osaka, Kobe, Shimonoseki

Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Chungjin

Manchuria—Antung, Mukden, New Town (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Lungchingtsun and six other minor offices

China Proper—Shanghai, Tientsin, Tsingtao

NEW YORK AGENCY:
165 Broadway, New York City

LONDON REPRESENTATIVE:
Palmerston House, 34 Old Broad Street,
London, E.C. 2

Correspondents:

San Francisco, Seattle, New York, London, Paris and in Other Commercial Centers throughout the World

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Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Established by the Japanese Government by virtue of a Special Enactment of Imperial Diet

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Capital Subscribed - - - Yen 50,000,000

Head Office: 8, 1-chome Marunouchi, Tokyo.
Cables: "Kogin," Tokyo

BRANCHES:

Tokyo: Nihonbashi *Osaka:* Koraibashi
Kobe: Nishimachi *Nagoya:* Minaminagashima-cho
Fukuoka: No. 80 Tenjincho,
Telephone: Fukuoka 1080; 6010

TOYOTARO YUKI, Esq., *President*

DIRECTORS:
ICHIMATSU HORAI, Esq. TARO KIMIMORI, Esq.
KOICHI KAWAKAMI, Esq. KOTAKE SHIGERU, Esq.

AUDITORS:
COUNT YOSHINORI FUTAARA
TEIZO IWASA, Esq.
NAOICHI TANAKA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

Business Transacted:

1.—Loans on the security of public bonds, of debentures and shares, estates (Zaidan), specified land and buildings.
2.—Subscription and underwriting public bonds or debentures.
3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

THE BANK OF TAIWAN, LTD.

Established 1899

Vice-President : TSUTOMU YOSHIDA, Esq.

Directors :

MASAJIRO ARAKI, Esq.
SEIZO KONDO, Esq.
KENJI YAMAMOTO, Esq.

Head Office : Taipeh

Tokyo Branch :

No. 2, 1-chome Marunouchi, Kojimachi-Ku.
Z. YAMAMOTO, Esq., *Manager*

Branches and Agencies :

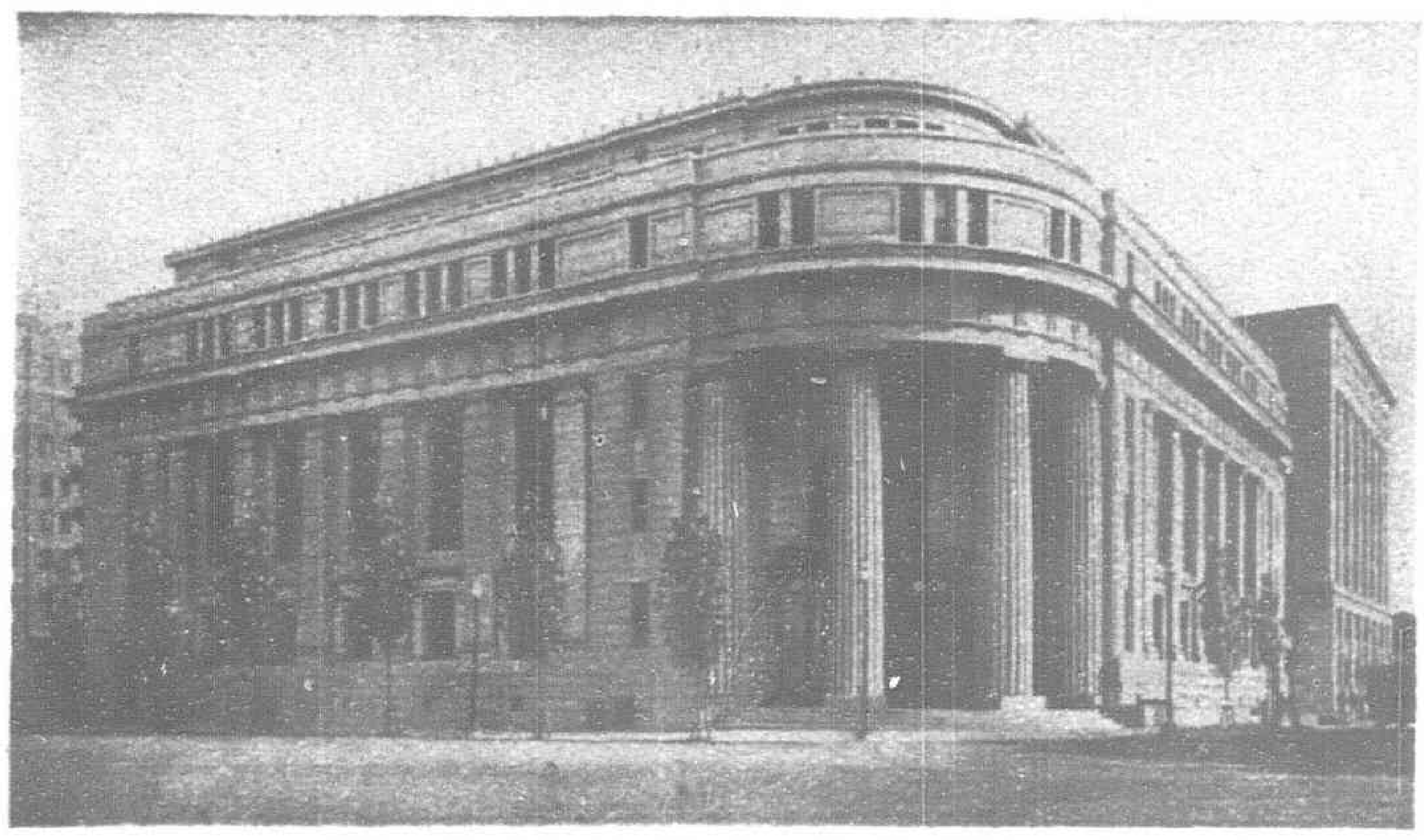
Japan : Kobe, Osaka, Tokyo, Yokohama, Giran, Heito, Kagi, Karenko, Keelung, Makong, Nanto, Shinchiku, Taichu, Shoka, Tainan, Taito, Takao, Tamsui, Toen.

China : Amoy, Canton, Dairen, Foochow, Hankow, Shanghai, Swatow.

Java : Batavia, Semarang, Sourabaya.

Others : Bombay, Hongkong, London, New York, Singapore.

Correspondents in the principal cities and towns throughout the world.



The Dai-Ichi Ginko, Ltd., Tokyo

THE DAI-ICHI GINKO, LTD.

(FORMERLY THE FIRST NATIONAL BANK)
ESTABLISHED 1873

Capital (Paid up) - - - -	Yen 57,500,000.00
Reserve Fund - - - - - -	Yen 57,500,000.00
Special Reserve Fund - - -	Yen 7,200,000.00

Board of Directors

KENGO ISHII, Esq.	*Chairman*
TERUO AKASHI, Esq.	*Deputy Chairman*
SAKAYE SUGITA, Esq.	*Managing Director*
VISCOUNT KEIZO SHIBUSAWA	*Managing Director*
JIRO TANAKA, Esq.	*Managing Director*
KOKI NOGUCHI, Esq.	*Director*
TOMONOSUKE KANOH, Esq.	*Director*
TOHTARO ONOYE, Esq.	*Director*
SHUJIRO SASAKI, Esq.	*Director*

HEAD OFFICE:

No. 1, 1-chome, Marunouchi,
KOJIMACHI-KU, Tokyo.
S. KODAIRA, *Manager.*

CITY BRANCHES:

Akasaka, Asakusa, Azabu, Fukagawa, Ginza, Gofukubashi, Hibiya, Hongo, Honjo, Horidome, Kabutocho, Kanda, Komagata, Kyobashi, Marunouchi, Mita, Muromachi, Osaki, Sanya, Shibuya, Shinjuku, Ushigome.

HOME BRANCHES:

Ashikaga, Fukuoka, Fushimi (Kyoto), Gojo (Kyoto), Hakodate, Hiroshima, Honmachi (Osaka), Hyogo (Kobe), Dojima (Osaka), Kiryu, Kobe, Kokura, Kumamoto, Kurume, Kyomachi (Kobe), Kyoto, Marutamachi (Kyoto), Senba (Osaka), Moji, Nagoya, Nishijin (Kyoto), Nishiku (Osaka), Osaka, Otaru, Sano, Sapporo, Shimonoseki, Shinsaibashi (Osaka), Tamayacho (Nagoya), Tatebayashi, Tochigi, Toyohashi, Utsunomiya, Yokkaichi, Yokohama.

BRANCHES IN KOREA:

FUSAN, SEOUL.

LONDON & NEW YORK AGENTS:

London :	Westminster Bank, Ltd., Midland Bank, Ltd., The Yokohama Specie Bank, Ltd.
New York :	The National City Bank of New York, The Guaranty Trust Co. of New York, The Yokohama Specie Bank, Ltd.

CORRESPONDENTS:

The Bank, in addition to its own branches, has numerous Agencies or Correspondents in the principal Cities and Towns at Home and Abroad.

THE YASUDA BANK, LTD.

Head Office: EIRAKU BUILDING, TOKYO

CAPITAL SUBSCRIBED - - - - - - - - - - Yen 150,000,000

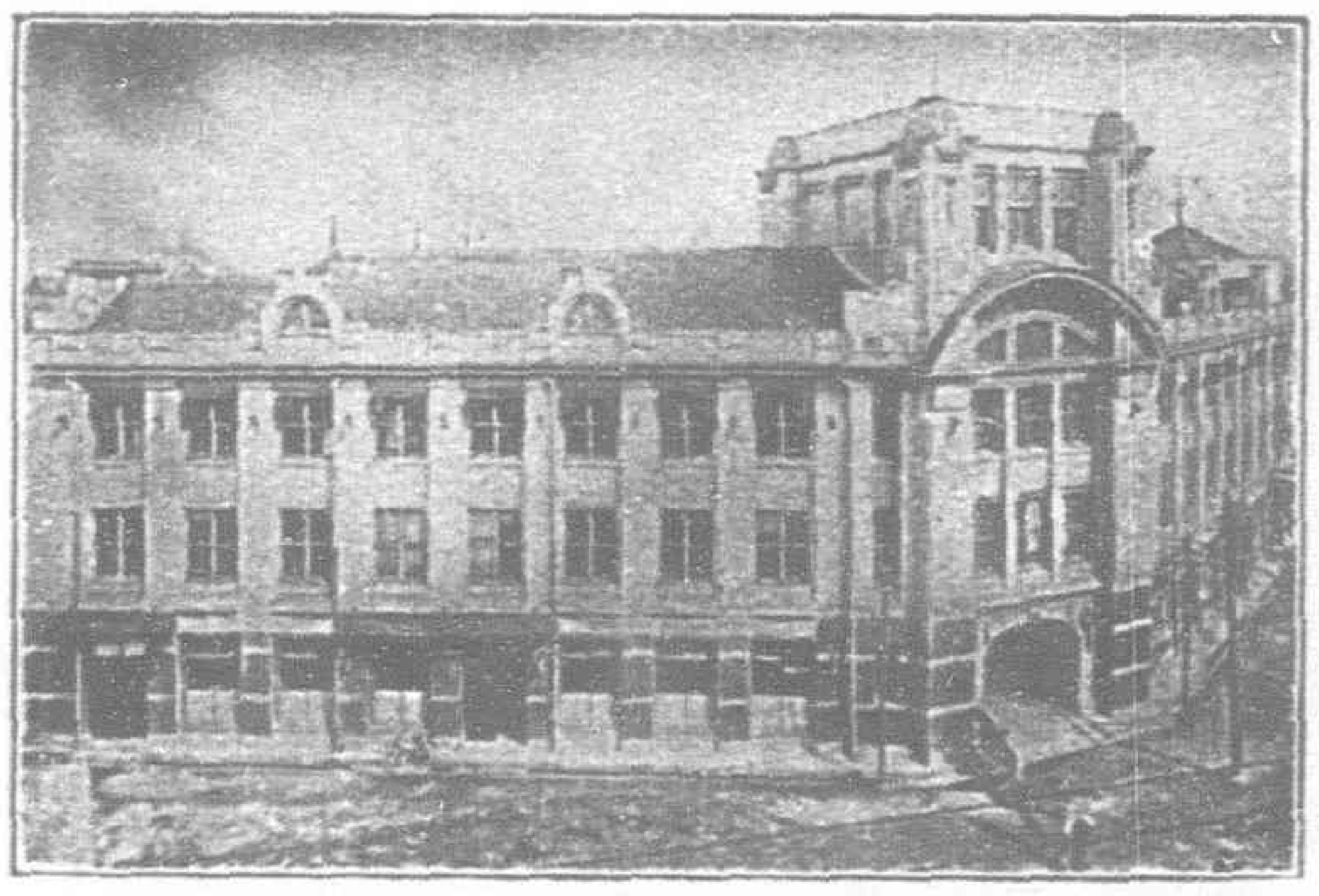
Chairman of the Board:
ZENJIRO YASUDA, Esq.

Deputy Chairman:
HIROZO MORI, Esq.

Managing Directors:
HISOMU SONOBE, Esq. TEIZABURO TAKEUCHI, Esq. YUZO HAMADA, Esq.

The Bank is now in command, not only of 135 Branches in Japan, but also of the services which it has secured from many correspondents throughout the world, and is able to offer accommodation for every kind of banking facilities, foreign and domestic.

Foreign Business:
TOKYO HEAD OFFICE
YOKOHAMA OFFICE, Honcho
OSAKA OFFICE, Koraibashi
KOBE OFFICE, Sakaemachidori



General Office Building of Ujigawa Electric Power Co., Ltd., Osaka, Japan.

UJIGAWA ELECTRIC POWER CO., LTD.

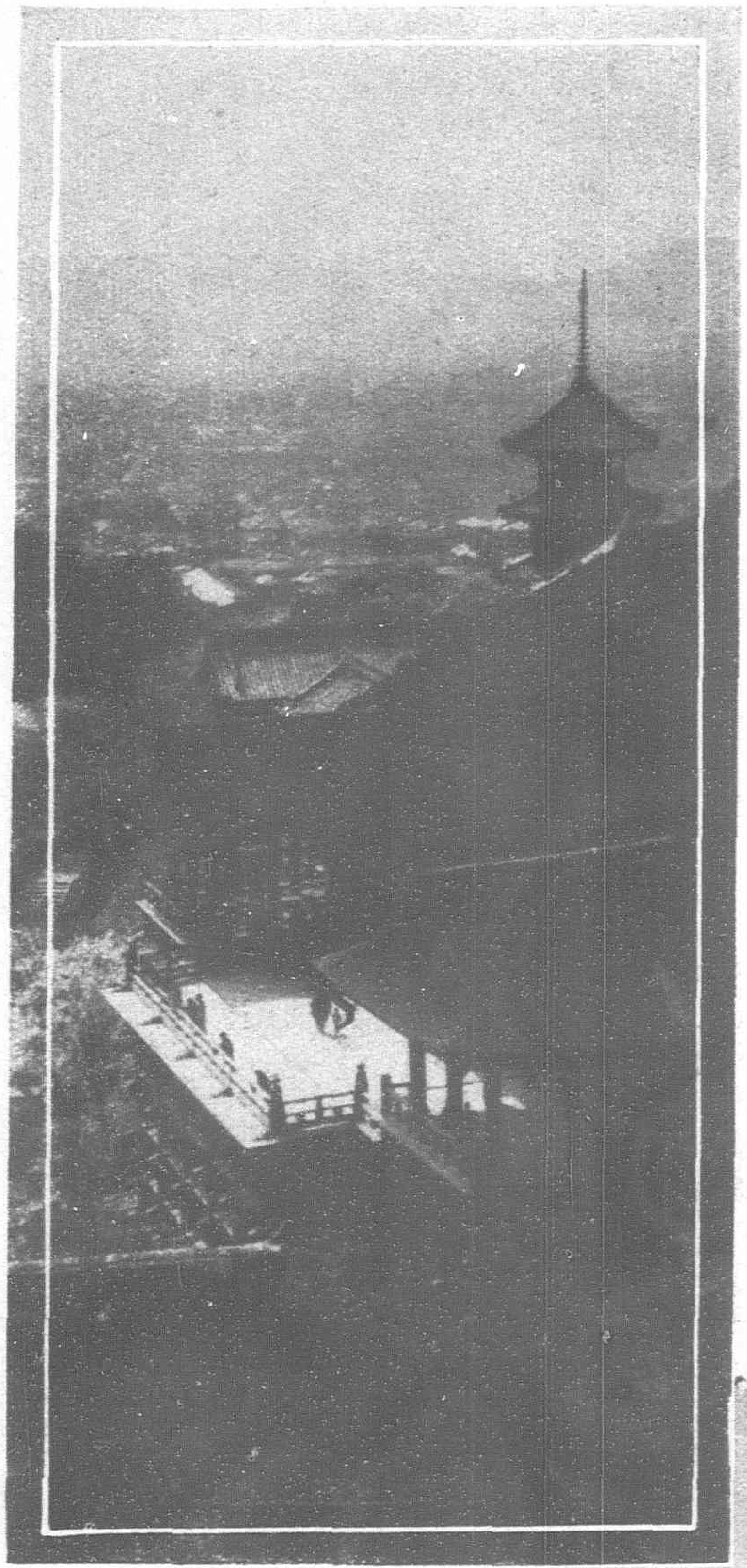
OSAKA, JAPAN

Authorized Capital - - - - - - - - - - - - - - - - - - Yen 85,000,000.00

YASUHIGE HAYASHI, *President and Director*
SENZABURO KAGEYAMA, *Managing Director*

17 Power houses (erected) with a total capacity of	111,700 kw.
4 Power houses (under construction) with a total capacity of	31,600 kw.
9 Power houses (permit obtained) with a total capacity of	83,400 kw.
15 Power houses (permit applied) with a total capacity of	36,200 kw.
Grand Total	262,900 kw.

Power supplied	267,021 h.p.
Its Customers	14,568
Electric Lights	319,186
Its Customers	146,040
Purchased Power	100,100 kw.



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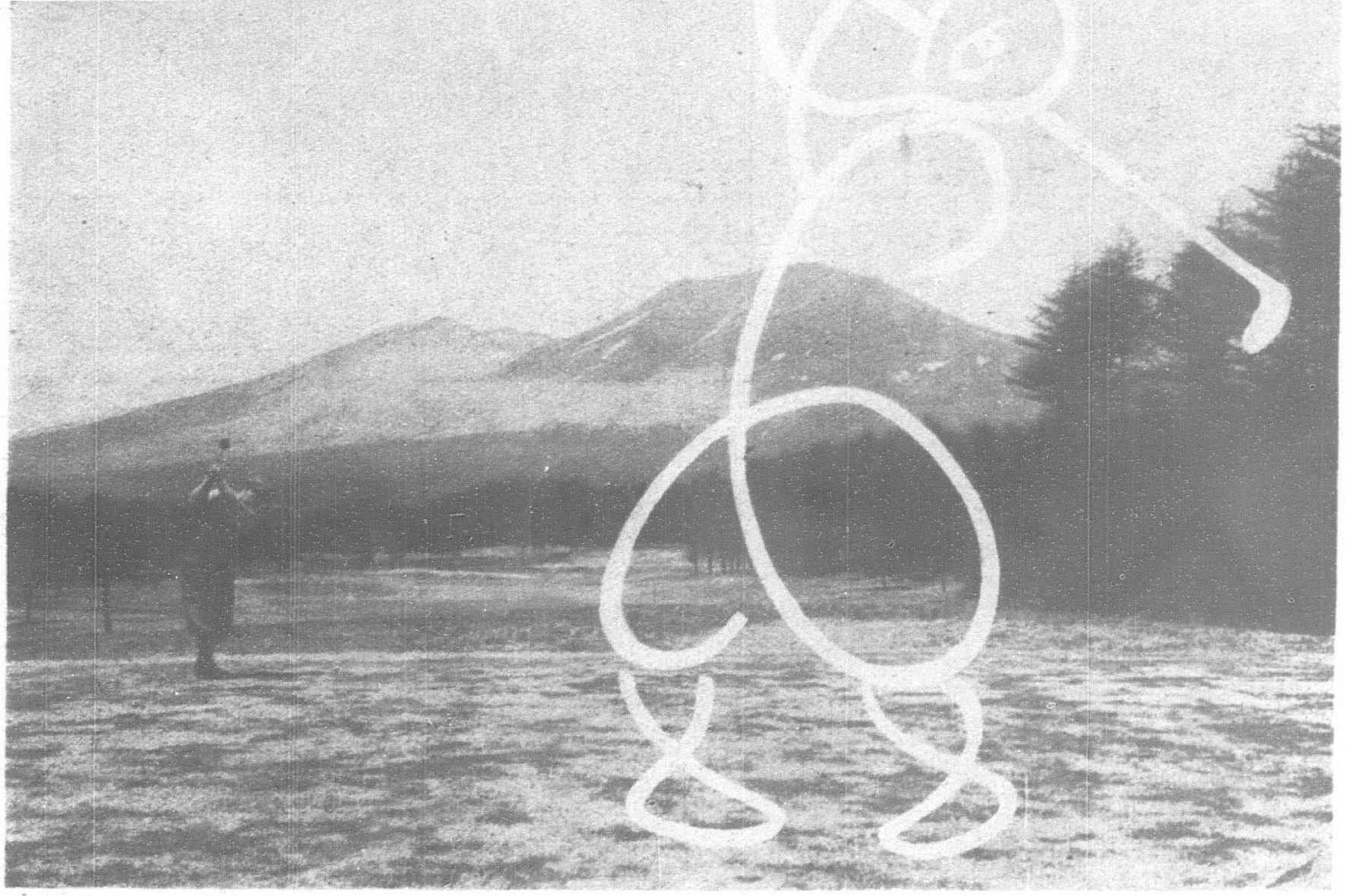

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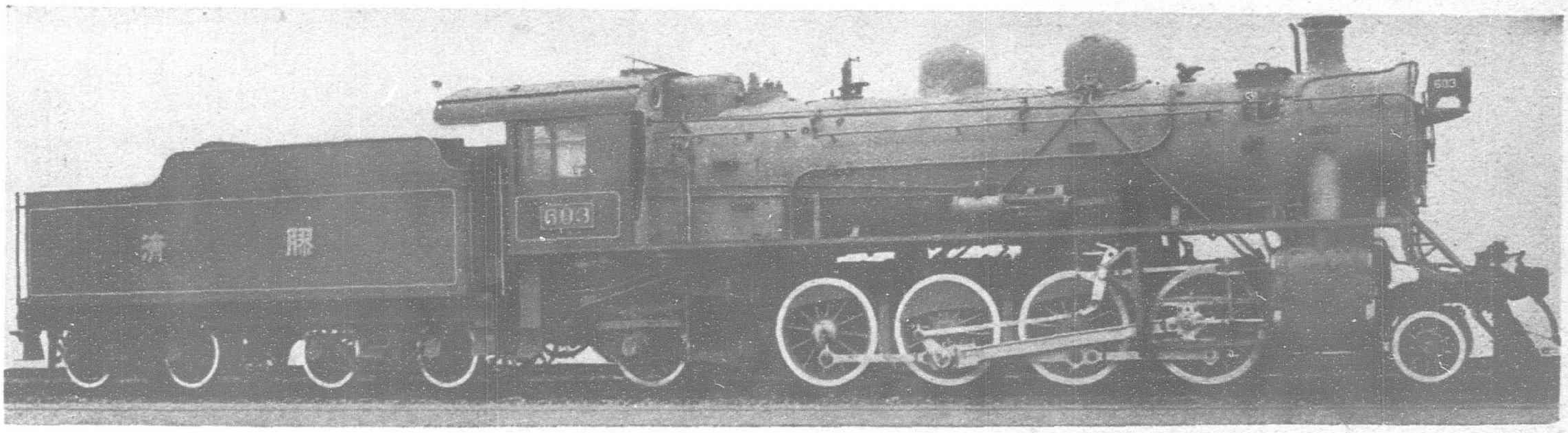
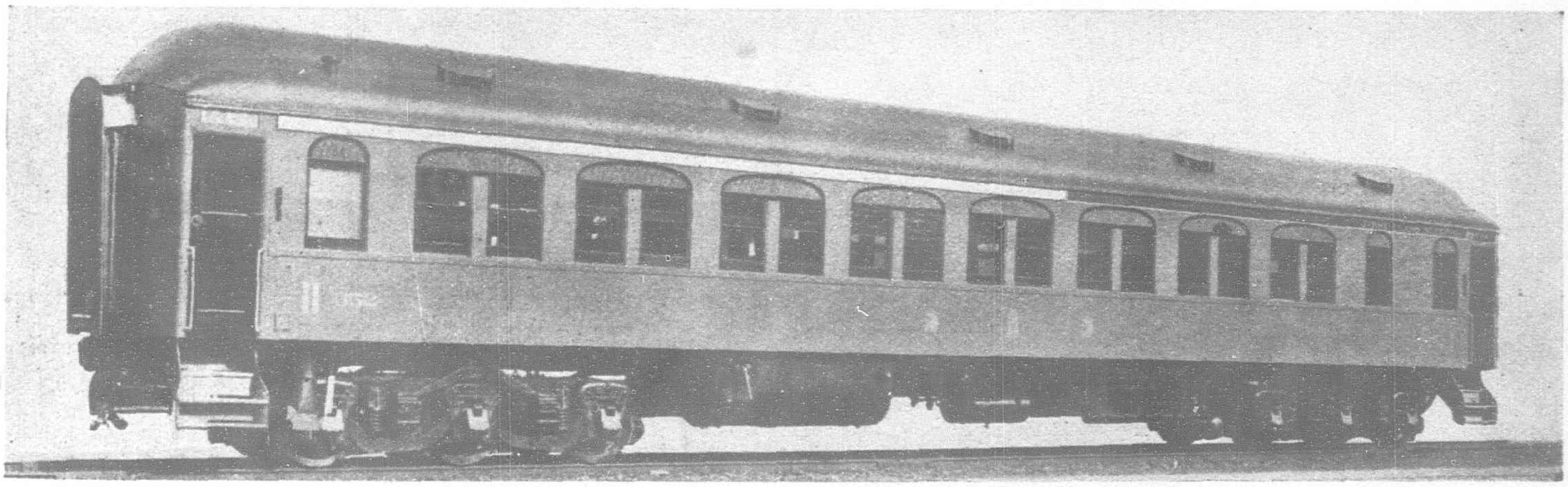


One of the Pacific Type Locomotives for the Chinese Government Kiaochow-Tsinan Railway built at the S.M.R. Workshops at Dairen



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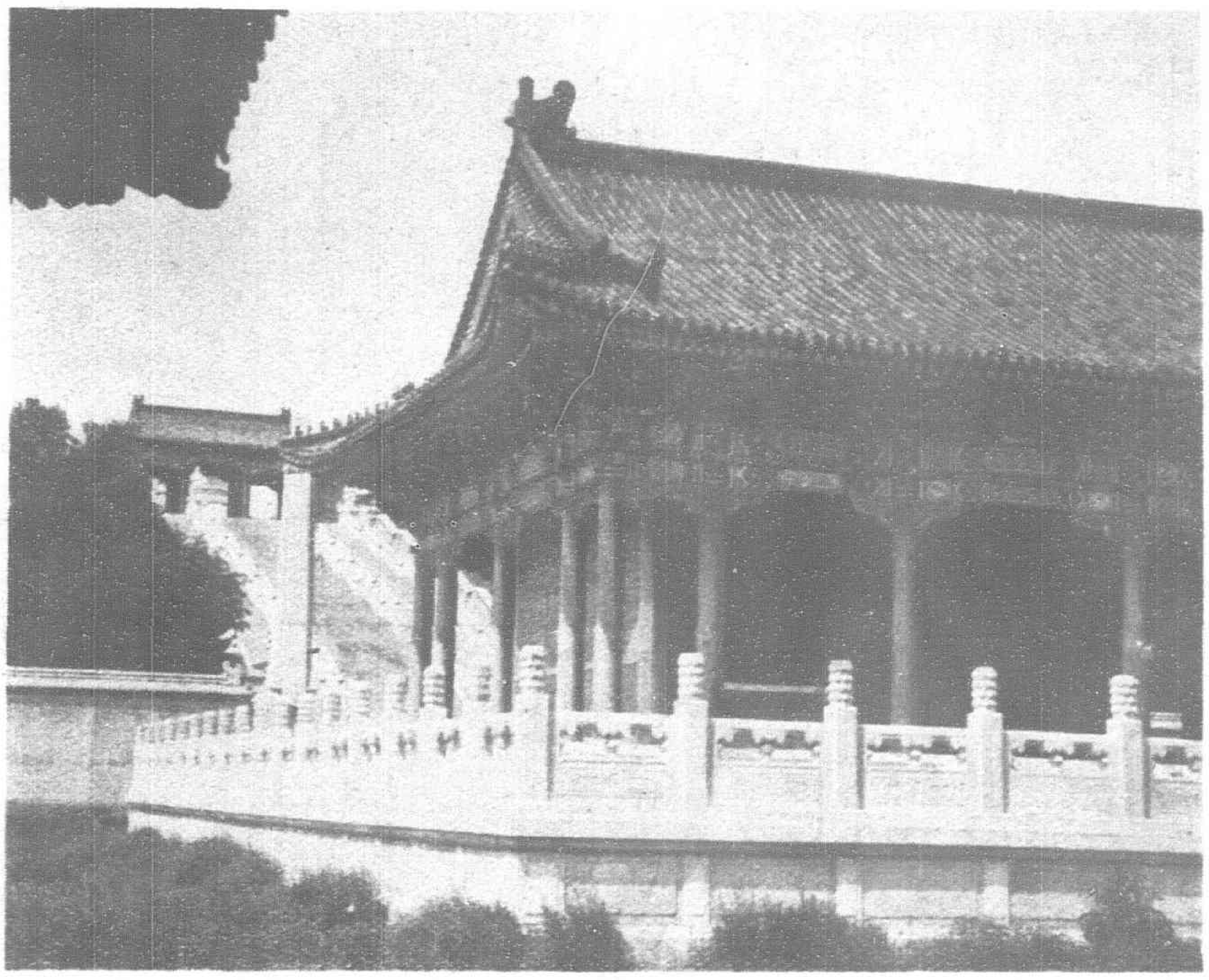

Mausoleum of Marshal Chang Tso-lin, near Fushun

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

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Japan's Sea Defense

Wherein is Presented the Nipponese Viewpoint on Consequences to Follow Abrogation of the Naval Treaty as Given by a Naval Correspondent in the "Osaka Mainichi"

THE world knows that the Washington and London naval treaties will die a natural death on December 31, 1936, and that the Imperial navy will assure itself once again with the dawn of 1937 of a period of freedom after a lapse of 16 years. Few realize, however, that Japan has practically nothing to lose and everything to gain by abrogating the Washington treaty, which is her right.

As every one knows, Japan in her eagerness to establish lasting peace in the Pacific and the Far East, has been firmer in insisting on her basic principles in the recent naval pourparlers in London than in any of the other international parleys of that sort in which she has participated. So strongly convinced was she of the justice of her limitation formula that she entered the preliminary conversations with determination to risk even rupture.

Unfortunately, Britain and the United States, particularly the latter, could not see the situation as Japan did and two months of overtures at London availed little or nothing. As things stand to-day, very little hope is entertained for getting the Americans to see Japan's claims. Even if the naval conference is convoked in 1935, as scheduled, naval experts doubt if an accord can be reached. Unless Britain and America, now on the upper end of the 5-5-3 ratio, alter their attitudes, the world's naval powers will be without a treaty after 1937.

The first thing to remember is that the Imperial navy has always known what it has been talking about—Japan's national defense will not be endangered in the least and the naval race, if it ever comes, can be met without the slightest misgiving. While no one thinks the navy has been making an idle boast, it would be as well for those not acquainted with facts and figures to see the optimistic calculations by the Imperial navy substantiated.

1937 U.S., Japan Navies

We may as well begin comparing the relative strength of the Japanese and American navies immediately, as the Washington and London treaties shall expire on December 31, 1936. In time of peace it is rather difficult for any nation to alter its naval construction program in a short time, say, in a year, largely because the situation is governed by its industrial potentiality, budgetary allowances, and available man-power.

Proceeding on the assumption that the construction programs of Japan and the United States progress as scheduled, the navies of the two countries will stand at the opening of 1937 :

					Ratio	
Capital Ships :						
Japan 9	272,070 tons	..	U.S. 15	455,400 tons	.6	(.6)*
Aircraft Carriers :						
Japan 5	78,420 tons	..	U.S. 5	100,500 tons	1.0	(.78)
Heavy Cruisers :						
Japan 12	107,800 tons	..	U.S. 17	162,450 tons	.7	(.66)
Light Cruisers :						
Japan 17	98,795 tons	..	U.S. 14	110,500 tons	1.21	(.89)
Destroyers :						
Japan 77	104,767 tons	..	U.S. 60	88,925 tons	1.28	(1.18)
Submarines :						
Japan 35	52,553 tons	..	U.S. 24	32,260 tons	1.45	(1.63)

(*Decimals in brackets designate tonnage ratio).

As will be seen from the above, although Japan is slightly inferior to the United States in capital ships, aircraft carriers, and heavy cruisers, she is at par in light cruisers and is decidedly superior in destroyers and submarines.

Furthermore, the Imperial navy has always attached utmost importance to the manipulations of such auxiliary craft as destroyers and submarines, and has demonstrated matchless skill in their construction. It possesses vessels vastly superior to craft of corresponding classes in the navies of other powers. So even granting that the United States is slightly stronger in larger craft, the superiority in smaller craft will just about offset the deficit in larger vessels.

The next thing to consider is the question of how the two navies will fare at the end of 1941, by which time the United States is expected to complete the Vinson program, whereby Uncle Sam is supposed to be enabled to build up to the treaty limit, and also whether or not the United States can launch an additional building program, following the completion of the Vinson scheme.

Inasmuch as the Vinson program proposes to replace the majority of existing light cruisers, destroyers, and submarines, and to double the aircraft carrier squadron in a matter of five or six years, the United States navy must build at the rate of 100,000 tons a year.

America has seldom built more than 40,000 tons a year since the Washington conference, whereas the Vinson program necessitates construction of two and a half times the average annual quantity, which means that American shipyards, either governmental or private, have been taxed to the limit, while ordnance plants are said to have been working under full blast day and night.

For the necessary appropriations, even the vast resources of the United States have been found none too bountiful. The ordinary account is unable to take care of the construction program, so the Washington treasury has been floating annually $3,000,000,000 in loans for the job.

Under the circumstances, unless Uncle Sam has recourse to wartime mobilization, it is doubtful if she can speed up the Vinson program, much less launch additional programs. No one recognizes this difficulty more keenly than the government authorities in Washington, who have admitted as much on several occasions.

In striking contrast to this, the Imperial navy will have considerable reserve potentiality to spare after 1937. By that time all vessels under the first and second stage replacement programs will have been launched, which will give all shipyards a chance to begin fresh construction if need be.

Japan's naval construction capacity, even at the time of the Washington conference, proved entirely capable of taking care of two capital ships of more than 30,000 tons and several auxiliary craft annually, necessitated by the so-called "8-8" fleet programs.

Although dockyards in places were made slightly smaller after 1921, there is no danger whatever of shipyards being saturated with orders for warships.

Besides, the science and skill accumulated by Japan's constructors and mechanics is something, according to naval authorities, that builders abroad can hardly expect to duplicate. All the navy has to do is adjust the defense scheme after 1937, unhampered by treaty shackles.

The fact that the Imperial navy can amply take care of defense at a cost not greatly exceeding that for maintaining the Washington and London treaties, has been time and again vouchsafed by navy authorities. Their words, taken at face value, mean that come what will the Imperial navy will not drain the Empire's resources.

Whatever red ink loans the Imperial navy may have to float, they will be nothing compared with Uncle Sam's $27,000,000,000, *excluding the $3,000,000,000 in bonds Washington must issue* annually, is the opinion of experts.

It is not at all uncommon for the man in the street to deduce offhand that abrogation of the Washington treaty will immediately culminate in a naval construction race, which in turn will endanger national finances. Authorities of the Navy Office have been sparing neither time nor energy in convincing the public that such is a mere myth.

Before substantiating the naval authorities, it would be well to cast a glance upon the history of Japan's naval construction and to give a historical critique on it.

In the days preceding the Sino-Japanese war of 1894-95, the "minor" Japan rated "major" China infinitely more powerful than herself in every way. In fact, Japan in those days considered China even more formidable than the present day United States in the eyes of the world.

Nevertheless Japan, by assembling a navy sufficient to outclass the Chinese fleet in quality and quantity, dealt a crushing blow in the battle of the Yellow Sea and subsequent engagements. In the days before the Russo-Japanese war, too, Russia was rated as possessing incomparably greater potentiality than Japan.

Yet, Japan in scarcely more than 10 years built up a navy strong enough to annihilate Russia's Far Eastern and Baltic fleets. By the time the Washington conference was convoked Japan's so-called "8-8" fleet program was in full swing. It was intended to enable Japan to attain 70 per cent of the United States navy even should the latter complete her three year building program—a 10 to 7 ratio was believed enough for Japan then.

As far as actual strength was concerned, Japan commanded 80 per cent of the capital ship strength of the American fleet then—Japan had 10 super-dreadnaughts including the *Mutsu* and the *Nagato*, whereas the United States had 12 vessels of a corresponding class, including the *Maryland*.

One outstanding fact is this: The Imperial navy has always maintained sufficient strength to insure the Empire's security whether naval armaments were restricted by treaty shackles or not. Although the financial burden imposed by the naval program cannot be gainsaid, naval preparedness at no time has endangered national finances. Moreover, adequate naval defense has always preceded added prosperity to the nation.

When the Washington treaty was signed on February 6, 1921, many pacifists believed that naval construction races had come to an end. The result has been just the opposite. In order to offset the deficit in capital ships and aircraft carriers, Japan has gone to considerable expenditure in perfecting auxiliary squadrons.

So, by the time the powers convened for the London conference of 1929-30, Japan commanded far superior strength in auxiliary vessels as compared with the United States. Where the United States had only one 10,000 ton cruiser, Japan had eight such vessels, while Japan had 21 light cruisers against America's 10. In the latest destroyers and submarines, Japan was likewise superior to America.

Although the London treaty drastically reduced the respective holdings of Japan, Britain, and the United States in auxiliary vessels of all categories, the limitation instead of subduing the race, has aggravated it. The Imperial navy, by launching the first and second stage replacement programs, has been spending considerable sums to perfect light cruiser squadrons, vessels outside the treaty limitations, and naval air forces.

These facts go to show that naval preparedness has seldom, if ever, culminated in a suicidal construction race and that the existence of naval limitation treaty has never prevented a race. If history repeats itself, then naval authorities feel sure any naval race that comes will not bankrupt the nation.

Japan launched the so-called "8-8" fleet program in order to match America's three year program calling for the construction of 40 super-dreadnaughts by 1923. By that plan Japan meant to complete a super-dreadnaught and a battle cruiser every year, which of course pre-supposed no small financial difficulty.

U.S. Hit Harder

The fact remains that the naval race at that time hit the United States considerably harder than Japan, according to information gathered by naval authorities. America's three-year program to match Japan's "8-8" plan, proved to be not only slipshod, but extremely costly. Besides, the Washington government found it none too easy to secure enough officers and men to man the new ships.

Even if sufficient man-power could have been obtained, the American government would have been up against the serious difficulty of paying enormous overhead, for American service men draw from five to 10 times as much pay as those of Japan—salary and wage accounts constitute fully 30 per cent of the total U.S. naval expenditures, whereas in the Imperial navy personnel overhead consitutes but 10 per cent.

It is easy to see that even if the three-year plan had gone ahead, as scheduled, the United States with all her vast resources would have found it exceedingly difficult to maintain the swollen fleet. Besides, the wartime boom had gradually begun to decline and the future prospects were none too encouraging. Some of the capital ships built under this plan are said to have betrayed technical defects due to hasty designing.

If her internal difficulties were serious—they were—her troubles from without were infinitely more so. The United States emerged from the World War the greatest creditor nation in the world. The domestic loans Uncle Sam floated in wartime reached the staggering figure of $27,000,000,000.

In other words, Uncle Sam borrowed this amount from his citizens in order to advance it to European nations. If the United States was to execute the huge construction program seriously, Britain would have had to build to match the American navy, and the British construction would have incited France to launch a program.

This would have thrown the whole of Europe into a turmoil of naval construction. Europe has found it most difficult to settle her debts with America. Had a naval race been started, in addition, America's $27,000,000,000 would have been made a dead account then and there!

There is little doubt in the minds of many that a huge naval race would have culminated in a second World War, which the hundreds of thousands of American women who lost husbands, brothers, and sons in the world war, would hardly have tolerated.

The United States government, without indicating to the slightest degree the enormous difficulties she had on hand, succeeded in imposing upon Japan a five to three ratio, declaring to the world that the execution of the "8-8" fleet program would have led Japan into bankruptcy!

That is where the Japanese nation must blame itself in a measure. The rank and file of the nation swallowed the American propaganda, bait and hook.

The golden rule of fighting men is: "Believe that your enemy has three times as great trouble as yours. No battle is lost until the last man is out." This applies to civilians as well as to first line fighters. Had this nation kept a grip on itself and given the delegation at Washington deserved support, there would have been a different story to tell in 1921.

Until about the close of the Russo-Japanese war of 1904-05 the Imperial navy depended almost entirely on foreign yards for construction of first line vessels, and of course practically all ships that took part in the Sino-Japanese war of 1894-95 were built abroad. The Navy's persistent effort for placing construction and ordnance on self-sufficing basis since the war with Russia gradually has borne fruit, and to-day there is not a thing that cannot be produced in Japan. The battle cruiser *Kongo* (re-rated a battleship later) which was completed in England in 1913 is the last of the imported vessels.

The art and science of naval construction cannot be developed overnight, however. Even during the Washington conference

Japan's naval construction was not all that could be desired. It barely managed to hold its own against Britain and the United States. In those days the policy of the Imperial navy was to match Britain and America in quantity and not in quality, as evidenced by the "8-8" fleet program designed to give Japan 70 per cent strength compared with America's three year building scheme.

The skill and science developed by Japan's naval constructors in the post-Washington days is nothing short of marvellous. There cannot be a shadow of doubt that vessels of all categories launched by Japanese yards stand in a class by themselves. Our vessels, when compared ship for ship with those of Britain and America, are considered more than a match for theirs.

Quality Greatly Improved

While Japan's naval construction was yet in its transitional stage our warships bore striking traces of imitation, which perhaps could not be helped very well. During the past decade and a half, our constructors have been unusually successful in striking their own lines, and have created distinct departures from anything hitherto produced anywhere. Where our constructors were not absolutely sure of matching Britain and America in quality during the Washington conference, they are positively confident to-day in that respect. In fact, quality is as much their *forte* as quantity.

As previously described, Japan's naval policy has invariably consisted in maintaining bare necessities for defending her shores. In other words, the Imperial navy has always surmounted whatever financial difficulty there may have been, in order to operate and maintain a fleet of sufficient strength to crush any enemy fleet that a power can presumably send to Far Eastern waters.

It should be remembered that, even when the United States, which is rated 10 times as wealthy as Japan, was at the apex of prosperity immediately preceding the Washington conference, Japan was able to hold 80 per cent capital ship strength, compared with America.

It is significant that Japan demonstrated her ability to present and "8-8" fleet program against America's three-year scheme, which hardly went beyond blueprint stage.

The lapse of 15 years since has seen an epochal change in the economic potentiality of Japan, and the advance in Japan's naval construction has kept pace with the changing times. Even should the U.S. challenge Japan with an insane naval race after the expiration of the Washington treaty, which wise Americans would hardly tolerate, the Imperial navy is absolutely confident of its ability to meet any situation. In fact, it feels that to maintain parity with America to-day would exact much less financial strain than the execution of the "8-8" fleet plan 15 years ago.

Everything Available at Home

Another factor that counts much is the fact that unlike the days of imported vessels and armaments, everything needed for the navy is available at home, which prevents the national wealth from flowing out of the country. Besides, development of the munitions industry acts as a general industrial stimulant and helps materially towards relieving unemployment.

The Washington treaty will go definitely out of existence on December 31, 1936, meaning at the same time automatical cancellation of the London treaty. That the Imperial navy will have nothing to concede to the American navy after the treaty expiration and that there is no danger of an extensive naval race, ought by this time to be obvious, after what navy authorities have painstakingly explained.

Even presuming that a stupendous naval race should be launched five or 10 years hence, Japan has latent potentiality enough to accept any challenge. It is not at all difficult to see that "we'll outarm you, if you don't like your inferior ratio" will no longer carry any weight with Japan.

The ratio system imposed by the Washington treaty on the assumption that naval engagements will occur in Far Eastern waters will end with the expiration of the treaty. If Japan's new limitation formula, presupposing lasting peace in the Pacific, is accepted by Britain and America, well and good. If not, Japan will proceed along her own lines.

Government and People United

The thoroughly united front presented by the government and people, the rapidly accumulating national wealth, the unquestioned caliber of the Imperial navy, and the matchless skill of the naval constructors all combine to make the national defense of the Island Empire airtight, regardless of the menace that may face Japan from without.

In connection with the naval limitation situation, a navy officer remarked in a reminiscent mood:

"It will be recalled that when Japan made up her mind to withdraw from the League of Nations in 1933 not a few of our countrymen thought such a thing as economic blockading of Japan was possible. If anyone hints at sanctions to-day, his sanity would be questioned.

"What has happened since has been just the opposite. Japan's merchandise has gone to every corner of the globe, as it never has in the past. What will happen after Japan has cancelled the Washington treaty is perhaps too obvious to every citizen of the land. Who would believe anything will happen that is not good?"

The Japanese Naval Position

Island Empire Has Matchless Geographical Advantages and Cannot Successfully be Blockaded

By ADMIRAL NOBUMASU SUETSUGU, Commander, Yokosuka Naval Base in the "Osaka Mainichi"

The first line defense of a nation would prove much more effective if laid around the border of an enemy power, than if it flanked the nation's own shores, that is, if a power could have its choice. In the days of Horatio Nelson early in the 19th century, the British first line defense consisted in laying network of its own fleets close to hostile shores to see that the enemy vessels were sealed within.

The fact that the British were able to do it then marked the beginning of Britain's years of sea supremacy. For seafaring nations like Britain and Japan maintenance of a first line defense out of the home waters would be the ideal defensive strategy. Napoleon, great as he was, could not do a thing with Britain, simply because the British fleet succeeded in holding a tight grip on the French shores.

In the Russo-Japanese war, Admiral Togo's combined fleet succeeded in bottling up Russia's Far Eastern fleet in Port Arthur (now known as Ryojun) throughout the campaign, and in keeping its eye on the Vladivostok squadron. These are some of the most vivid exemplifications of pushing the first line defense around the enemy frontiers. Needless to add, this is possible only when a power possesses incomparably superior naval strength.

Blockading Impossible Now

In these days of highly advanced armament science, no nation, however formidable its navy, can very well form a blockade, largely because of the remarkable efficacy of submarines and aircraft. These armaments make it almost impossible for an invading fleet to approach the enemy shores. Of course, there is such a thing as blowing up the enemy's undersea craft, but it is easier said than done.

The most that any power intending to blockade the enemy country can hope for is what might be called an indirect blockade.

This strategy consists in keeping a close watch on the enemy's base with submarines and aircraft while the main fighting unit waits in ambush at a distant base. The moment the scouting vanguard reports that the enemy's fleet is out on the high seas, the home fleet may go out to meet it. This was what the British navy resorted to during the World War.

Keeping a watertight blockade of enemy territory as in days gone by, is out of the question to-day. Even an indirect blockade cannot be accomplished unreservedly, unless a nation has an extremely favorable geographical position.

North Sea Responsible

The North Sea was responsible for the indirect blockading of Germany by the British navy in the late war. There, all the British navy had to do was guard the two entrances. The Strait of Dover, the southern entrance, is only 20 miles wide, while the sea between Scotland and the Scandinavian peninsula, which extends some 200 miles, is the northern entrance and exit.

As long as the British navy kept watch on the two entrances, even though the northern portal was considerably wider than the southern one, Britain was in a position to strike a blow at the German fleet any time it went to the high seas. Such geographical advantage is not always available, however.

During the Russo-Japanese war of 1904-05 Admiral Togo's fleet had little or no difficulty in holding Russia's Far Eastern fleet in Port Arthur. Against the Vladivostok squadron, the best that the Japanese navy could do was to blockade it indirectly, by keeping an eye on the three entrances to the Japan Sea; namely, the Chosen Channel, the Tsugaru Straits, and the Soya Straits.

Japan, Britain, U.S. Alike

The world's three major naval powers, Japan, Britain, and the United States, are almost impossible to blockade, or even to watch. Each has an enormously long coast line, insuring innumerable outlets. Unless an adequate base is at the command of the prospective invader, blockading tactics, direct or indirect, are impossible.

That is what makes present-day naval campaigns so extremely difficult and complicated. Even granting that a nation possesses an exceptionally superior navy, it does not necessarily follow it can lay its first line defense around the enemy territory.

From the defensive standpoint such a fate as eventually befell Germany, who was compelled to let the allied forces dictate terms because of the hunger of her people, cannot come to Japan, her geographical advantage making it impossible for any prospective invaders to effectively blockade the Island Empire.

Supposing the Pacific becomes the future battlefield, Japan should rigidly fortify vantage points to maintain effective communications between them, and to mobilize the fleet in accordance with the movements of the enemy fleet. This ought to be obvious even to laymen.

Easy to Defend

It can be easily seen that Japan is an easy country to defend, but a difficult one to invade from without. But then, so are Britain and the United States. As long as they are contented with defending their own shores, their defensive problems will be simple.

It is precisely for this consideration that Japan has been urging equality of armament in the London pourparlers. She has been advocating the establishment of a common upper limit within which the powers concerned shall be able to fulfil their own defense requirements, without any power becoming a menace to another.

Had Japan no other claim to eminence, the common upper limit alone would suffice to win universal recognition for reasonableness. Japan has been proposing drastic reduction of the existing strength of principal naval powers. Only a power without sinister ambitions could do this.

It is clear that the American and British insistence upon retaining superior ratio is not justified. Their demands, if recognized, would give them margin enough to wage a war on us, but would leave us powerless to do as much to them.

A defense line on water, far from being a physical thing, cannot always be designated in black and white. It is a different story, however, if a nation has a peculiar geographical feature all its own. Then the nation knows it has something by which to safeguard the homeland, something by which to check an attack.

It is largely for this reason that the mandated Pacific Islands are regarded as Japan's first line marine defense or Japan's ocean life line. The innumerable isles and islets extending from Izu Shichito, the Ogasawara islands. Kazan Retto, the Marianne group, the Marshal group, and the East and West Caroline groups, constitute a natural sea defense line for Japan.

As long as Japan is able to hold these isles, she may rest assured that her national safety is secured. A peculiar feature about them is that Japan's possession of the isles does not menace any power, the isles being too far away from other countries. Supposing, however, that they should come into the possession of a foreign power or be occupied by an enemy nation, they would at once endanger Japan's defense.

Easy Matter for Enemy

An enemy fleet would then be enabled easily to cruise in Far Eastern waters, making these islands bases. Besides, these isles are naturally built aircraft carriers and would afford the enemy air squadrons ideal places from which to operate. In that event, Japan would be exposed to untold danger.

These islands are apparently made to order for Japan. In fact, the Pacific equilibrium can be maintained only when Japan holds them. If by any chance these isles fall into the hands of another power, the peace in the Pacific will at once be destroyed. That is why Japan under no circumstances can relinquish the isles.

Japan has another good reason, aside from strategical consideration, for retaining the mandated isles. Those who are at all acquainted with the history of the islands' ceding unite in declaring that Japan is under no obligation to return the islands.

The League of Nations had nothing to do with the transfer of islands. They were taken possession of by the Imperial navy during the World War and were formally awarded to Japan by the allied countries following the restoration of peace. So, League or no League, there is no legal reason for Japan to relinquish the isles.

Value of Northern Isles

The strategical value of the Chishima archipelago cannot be emphasized too strongly. America is reported to be taking the initiative in investigating thoroughly the defense possibilities of Alaska and the Aleutian islands of late. She is likewise rumored to be considering an improvement of the facilities in those regions.

Shimushuto, the northernmost island in the Empire of Japan, is but 600 miles west of the westernmost of the Aleutian group. As far as sheer distance goes, that direction assures the quickest access to Japanese territory from without. That part of the world is, however, one of the worst traps for mariners and airmen, being enveloped in dense fog most of the time.

The fact that American airmen have had to swallow bitter pills time and again was due to adverse meteorological conditions. I entertain little doubt, however, that by the time science devises much better airplanes than at present and weather conditions of that region are thoroughly charted that portion can be made safer for regular air services.

North Deserves Look-in

Despite the fact that the region has always been a regular ship lane, it is not suited for operating large fleet. Nevertheless that region, unless adequately guarded, would be exposed to danger because of the short distance across the northern route. Hitherto more or less overlooked, the region deserves serious consideration.

Sea defense and water-borne trade and communications are absolutely integral. In time of war there isn't a single sea route to and from Japan that will not be affected. It will then be impossible to maintain regular peacetime sea routes. The sustenance of the Japanese nation will then seek the safest zone or line of least resistance.

In time of emergency Japan's nearest neighbors, such as Manchuokuo, China, and Siberia will assume far greater economic importance as far as Japan is concerned. Manchuokuo, being Japan's ally, may be set aside for a moment. As long as China

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Developments in British Electric Plant Applicable to China

By A. J. PERCIVAL, A.M.I.E.E.

(Following is given the text of an address that was delivered at Shanghai, January 18, at the annual dinner of the China Center of the Institution of Electrical Engineers by Mr. A. J. Percival, Managing-Director of Messrs. Inniss & Riddle [China], Ld.).

* * *

The Institution of Electrical Engineers was founded sixty-four years ago. It was originally devoted to telegraphy. To-day it is numerically the strongest of the British Engineering Institutions and there are more than fifteen thousand members.

Its activities have grown with the amazing developments in the application of electrical energy,—Communications including Radio, Television, Sound Reproduction and Telephony as well as Telegraphy ; Electro-Medical Applications including X and other rays and Diathermy ; Power, Lighting, Heating, Traction, Ignition, Signalling, Electrolytic manufacturing processes, Electric Furnaces and Electric Welding Yet, so far, it has managed to keep all this remarkable brood of technical chickens under its ever growing wings. There are no separate electrical technical societies.

Perhaps the most outstanding discovery of this century has been the discovery by deduction, that we, each of us, in common with the rest of the universe, are a complex of electrical forces, —in that all living matter including that which I am about to ask to drink to this Toast, consists of atoms which have been proved quite conclusively to be closed and balanced systems of electrical energy. Consequently, comparatively young as our Institution is, we should be logically correct though doubtless very imprudent, if we adopted an all embracing or paternal attitude to the older technical societies.

I was fortunately able to attend a meeting of the Council of the Institution in London last summer and, to give you an idea of the care taken in their work, I would mention that it transpired that the subcommittee who were responsible to the Council for last year's revision of the Wiring Regulations, met more than two hundred and fifty times before their final draft was produced.

* * *

While I was away from China last year, I managed to see 14 other countries and in England in the summer I visited many of the manufacturing centers and took the opportunity to find out at firsthand something of what has recently happened in British electrical design and manufacture, particularly in the range of plant in which China is to-day interested. Before attempting to generalize on what I saw I will deal with important sections.

Boiler Plant

In deciding on what steam conditions are to be used in power plants, a balance has to be struck between the additional capital charges resulting from the higher manufacturing costs of boilers for the desirable higher pressures and temperatures, and the reduced steam consumption in the turbines.

Taking China's circumstances into account, the most suitable pressure is from 370 to 400 lb. per sq. in. gauge with a total temperature of 750 degrees Fahrenheit. The difference in efficiency of the most efficient turbines operating at these steam conditions is to-day only five per cent between a 3,000 kw. unit and a 25,000 kw. unit and the conditions I have named are consistent with simple and economical design of both boiler and turbine.

A boiler efficiency of 85 per cent of the net heating value of the fuel is expected from a well designed modern steam raising plant but it may be higher if special exigencies demand it or, if fuel is very cheap, capital costs and consequent capital charges may be advantageously lowered and an all-in economy result from designing for an efficiency of from 82 to 83 per cent.

Generally speaking, fine or dust coals should be fired pulverized but there has been a great improvement in the design of mechanical chain grate stokers. Most fuels which are suitable for pulverized firing can be burned equally satisfactorily on stokers. The cost of a pulverized fuel fired installation generally exceeds that of a comparable stoker fired one but the cost of its maintenance has usually been found to be higher, on account of the wear and tear on the milling plant. Moreover the power consumption of its auxiliary plant often offsets any gain that may be attributed to pulverized fuel firing. It is much more expensive to collect the grit and dust from powdered fuel than it is from stoker fired fuel but smoke prevention has not seriously concerned China as yet.

Turbines

The recent considerable increase in turbine efficiency is mainly due to improved design in nozzles and blading and to the use of higher velocity ratios. The closest attention is now given to the elimination of eddies in the steam flow and thick leaving edges to nozzles are carefully avoided. Special means have recently been adopted to ensure absolute accuracy in nozzle area with consequent correct pressure distribution. Smooth passages are thus ensured for the very narrow nozzle widths such as are required for the high pressure ends of medium ratings up to 10,000 kw. This is a most important factor in obtaining high efficiencies.

The adoption of regenerative feed heating is almost universal in present day power plants because this results in lower heat consumption, reduced erosion and increased turbine output for a given exhaust annulus area, or alternatively, a smaller condenser for a given output.

The general requirements for China are at present for units up to 10,000 kw. rating and for such the latest practice is to have the steam rotors turned out of the solid forging so that all the wheels are integral with the turbine shaft, thus eliminating any chance of trouble due to slack wheels. In order to eliminate all possible chances of flaws in the rotor forging, when the diameter of the shaft permits, a hole is bored through its center to allow of examination of its interior by the boroscope.

While phosphor bronze blading has given very satisfactory results over a long period of years especially where it is exposed to the corrosive action of wet steam, the selection of blading material for modern steam turbines of large output, operating at high speeds and at high steam conditions and high vacua, becomes of increased importance because in these conditions high efficiency can only be obtained along with increased liability to erosion. This erosion is apt to be more pronounced in the exhaust stages where the blades are usually of " twisted " form so as to preserve correct angles and passages as the blade speed increases from the inner to outer diameter. The elimination of erosion is generally achieved by having well rounded edges without unduly affecting efficiency and by the provision of an effective draining system.

On the other hand corrosion is usually associated with unsatisfactory steam conditions so that modern conditions emphasize the need for pure feedwater, de-aerating plants and evaporators to deal with make-up water. The best blading results have been given by stainless steel, nickel-coated mild steel, hecla ATV and chrome vanadium steel, the choice being determined by the stage in the turbine. For rotors tempered nickel chrome-molybdenum steel is used. Fabricated welded construction for turbine casings and condenser shells is becoming common practice.

England has made no serious experiments in Mercury Vapor installations but recently two such sets, each generating 20,000 kw. on the Mercury side, have been put into operation in America and their results have shown that the expected efficiency of the Mercury Vapor Steam Cycle is fully realized.

The 10,000 kw. 3,600 r.p.m. steam set which was built by a British manufacturer for Detroit has been in operation for more than 10,000 hours with steam at a temperature of 1,000 degrees F. and it is the opinion of the operating company that units of 50,000 kw. rating can now be built with confidence to operate at this high temperature.

The use of steam at pressures exceeding 1,000 lb. per sq. in. is now agreed to be not commercially justifiable unless the units are at least 30,000 kw. rating, because they entail special and expensive design of boilers and feedpumps and increased complication in re-heating. The consequent higher capital and upkeep charges do not offset the saving in fuel.

Diesel Engines

The latest British practice in Diesel engines is very definitely towards greatly increased speeds with resultant reduction in space, weight and first cost and these engines will soon be developed to the high degree of reliability attained with the slower speed types.

It has already been proved conclusively that the rate of wear of such parts as crankshaft journals, crank and gudgeon pins and cylinders is not materially increased although at one time it was expected that this would be proportional to the speed.

Another advantage of the high speed engine is that their parts are lighter and less expensive and more easily changed than those of the slow speed type. If failure does occur the damage is generally more expensive but the risk of failure is rapidly being eliminated.

Turbo-Alternators

One of the recent and outstanding developments in British turbo-alternator construction is the displacement of cast iron in stator construction by fabricated steel,—cut by gas flame and electrically welded together.

Improved efficiency has resulted from the use of very high grade silicon steel for stator punchings and the consequent smaller quantity of ventilating air required, together with improvements in methods of rotor ventilation and the resulting elimination of external fans, have jointly resulted in a marked reduction in the general mechanical dimensions of high speed alternators.

Stabilized exciters, consisting of main exciter and pilot exciter in a common frame, are becoming standard practice on all large machines. Improvements have been introduced in automatic voltage regulators to provide the quick response characteristics essential in large supply systems.

Switch Gear

Much expenditure has been devoted in England to new and improved design of switchgear. The number of fully equipped switchgear testing stations is increasing and the time appears to be near when British users will demand test certificates with all but the smallest Oil Circuit Breakers.

Rupturing capacity tests show that the various new forms of arc control devices in Oil Circuit Breakers, such as these embodying the Oil-Blast principle, represent an enormous advance in circuit interruption. Half a million kva. can now be cleared in a 16 inch diameter tank with 1 to 1½ cycle arc duration without distress.

With the general increase in the size of low tension distribution loads, much research has been applied to Oil Circuit Breaker contacts, with the result that radical changes have been brought about. Pressure line contacts have been substituted for flat surface-to-surface contacts which have hitherto been universal and silver is now extensively used for them because, apart from its low initial resistance, its oxide is a good conductor.

The trend towards metal enclosure of switchgear with its advantages of compactness and increased reliability continues. For high voltage such as 66 kv. the latest practice is oil insulated metalclad switchgear in which oil is used, instead of compound, in conjunction with a conservator as in transformer practice, to ensure that condensation caused by breathing, which cannot be avoided with compound filled chambers, does not occur.

Transformers

The outstanding recent transformer developments have been improvements in insulation and winding construction arising from intensive research in England and America on surge phenomena, and the consequent demand for greater transformer strength than the adjacent system insulation, to withstand lightning and other surges.

The use of " no-load " tap changing gear is now common for coping with the problems arising from the rapid increase in the size and loading of distribution networks.

A conspicuous British achievement has been the building of 600 kw. rectifiers, each in a single tank and delivering 20,000-volts D.C. for the new Broadcasting Station at Droitwich. This D.C. voltage can be depressed down to zero either by grid control or by induction regulators.

Motors

Fabricated steel construction in place of cast iron is fast becoming general in motor construction. Its use eliminates the possibility of defective castings and, as patterns no longer have to be considered, it has enabled the designer to produce the best machine to meet the required conditions and at a lower price.

With the extended use of scientific methods in industry more and more importance is attached to high efficiency. As an example of what has recently been achieved in that direction, I would mention a 1,300 h.p, 296 r.p.m. flour mill motor with phase advancer which gave an overall efficiency on test of 96.6 per cent with a power factor of 0.97. These extremely high efficiencies are obtained by the use of special silicon sheet steels and by accurate machine design. The temperature rise in such equipments is so low that heating is no longer a consideration in design.

Many power supply companies give reduced rates to consumers who maintain their power factor at a high value particularly on maximum demand. This has led to improvements in the design of synchronous motors, combined induction motors and exciters such as the No-lag motor made in England, and also induction motors in conjunction with phase advancers.

Variable speed shunt characteristic A.C. Commutator Motors up to 500 h.p. and having a speed range of 20 to 1, often controlled from top speed to standstill by movement of the brushes have been successfully developed and applied in England. In small motors the tendency now is to use motors which are built directly into the frame of the driven machine while special motors have been developed for many industries.

Britain's Electrical Position

The progress that has been made in lighting and traffic signalling would require separate papers to deal with in any adequate way and I have already said more than sufficient to outline the great technical progress in electrical plant which has been made in Great Britain during the world depression.

Great Britain to-day is the most favorably situated of all the countries in the world as regards the application of science and skill to industry. Until recently perhaps first or at least equal place would have been assigned to Germany, but partly as the result of the Nazi anti-machine philosophy, that is no longer so. I was told, on what may be taken as sound international authority, that actual production costs of electrical plant are definitely higher in Germany than in England in spite of the lower German wages.

The urge to development in the United States had inevitably been lulled by the shelter of her high protective tariff walls before the depression came. To-day their Government, in its economic activities, has become a gigantic public corporation ready to throw its weight into the scales whenever it deems it necessary to redress the balance of what is still called private business. The initiative is understood to remain in private hands except in public utilities and public works which, to use an electrical expression, are reserved as instruments of compensatory control. In such circumstances the lead in technical progress is hardly to be expected there in the meanwhile.

Great Britain is a small country still in many ways insulated by the sea. There the exchange of ideas is a quick process and proper organization is relatively easy to arrange for. Also we have a large body of men of high scientific and technical attainment backed by a unique standard of civil service performance and a growing respect for the technique of management. Our financial position is favorable and we have resources of raw material, both at home and abroad, plus the added stimulus of being part of the British Commonwealth.

It therefore seems inevitable that British engineering policy must be to think in terms of quality products, using to the full the resources of men and scientific training and mixing our skill with our raw materials. Thus high quality and technical improvement achieved at reasonable prices must continue to be the basis of British engineering exports.

Exports, nationally speaking, are the price that must be paid for the indispensable things which cannot be produced to advantage in the exporting country. In order to continue to import certain foods and raw materials, England must export and, notwithstanding the trading difficulties created by certain continental national policies, it seems assured that electrical equipment will bulk larger in British exports.

There are, of course, many factors which have contributed to the British economic revival but one that is generally overlooked is the great progress in engineering technique to which I have referred.

It is significant that the three outstanding successful types of semi-public control at home,—the Electricity Board, the British Broadcasting Association and the London Passenger Transport Board are primarily electrical services and, from what I saw and heard at home, I feel sure that planned control of electrical manufacturing, probably controlled by the industry itself, will sooner or later lead the other industries in what appears to be that inevitable direction. However, England has sufficient reserves to enable her to await results of the economic experiments now being conducted in America, Italy, Russia and Germany and can surely afford to wait a little and then step forward after careful selection.

It is hardly likely that anyone is against scientific progress. I happened to be listening-in in September at home when Sir James Jeans, in his presidential address to the British Association at Aberdeen, after deprecating the absurd talk of calling a halt to scientific progress, mentioned that Faraday's electro-magnetic induction, Maxwell's Hertzian waves and the Otto cycle, had provided employment for millions of men and that the economic value of one scientist alone, Edison, had been estimated at three thousand million pounds sterling.

China Electrically

To return to "the good earth"—not in an electrical sense but to China who first in the world discovered and used the lodestone,—one thing that impressed interested people at home was the great improvement in Chinese engineering specifications. Certainly some of the recent electrical ones can bear comparison with those of any other country.

China's tariff changes are being watched with sympathy and concern in the engineering industries at home and, in closing this address, I would like to briefly quote in this connection from the recent presidential address to the Institution of Mechanical Engineers given by Mr. Day with whom I discussed these matters. He said:—

"In the arranging of tariffs or quotas or whatever form of restriction is adopted, it is reasonable to suppose that these restrictions will not be applied to productions which can only be produced internally at great extra cost. Discretion will doubtless be exercised and it would appear that the relative cost of the home-produced article compared with the cost of importing that article, will be the deciding factor.

"If a small tariff will enable a certain type of product to be manufactured at home instead of imported, it is highly probable that such a tariff will be imposed, but if the tariff needs to be high, the users of the product will have grounds for objection.

"Applying this reasoning to engineering, it would seem that a machine which is manufactured in England on general engineering lines, can be manufactured in many countries without greatly increased cost, whereas if manufactured on mass production lines, then its manufacture in a country which has only a relatively small demand for it, could only be undertaken in that country under the shelter of a high protective duty, thus raising its costs greatly to users in that country." These facts are surely specially relevant to China to-day.

I saw not a little of the Chinese students in English works and, without exception, I had good reports of them including those sent home by the Federation of British Industries. There is no doubt that electrically Great Britain is determined to assist China's development to the maximum possible extent but the City of London cannot yet forget what happened with their China loans before the advent of the present National Government.

The Japanese Naval Position

(Continued from page 4)

and Siberia are stabilized, Japan need not worry about getting a supply of food, clothing, and daily necessities. Germany's fate will never be ours—we can sit tight for 10 or 15 years.

Possible Philippine Status

The independence of the Philippines will always bear vitally on Japan's national defense. If the islands are granted full independence, the problem will be simplified. But if America continues to hold a powerful naval base or to maintain formidable air corps there, independence will function in name only.

If America washes her hands of the Philippines as the rest of the world hopes, the islands door may be opened to ambitious young men from neighboring countries, particularly from Japan, for further developing the untapped resources of the islands, and all mankind will certainly gain.

From the American standpoint, continued retention of the islands will hardly pay. The reason America is none too willing to grant the Philippines real independence is probably this: By maintaining a formidable fleet on the islands, America believes she can continue to have a share in Chinese affairs.

Why Good Navy is Needed

Unless the defense line on the sea is tight, the best army on land would be of little use. Japan's land forces would hardly command as great respect in continental Asia unless they were backed by our matchless navy. At the same time the operation of the Imperial navy would not be possible if the resources in the continent were not protected by the army and were not properly developed.

The army and navy are positively interdependent. Their combined efforts assure the nation of economic existence. For a seafaring nation like Japan, their importance is obvious. If this point is brought home to the nation, the navy's importance will become clear to the minds of all.

Unless this nation grasps the true significance of the navy, the fundamental problem of what to do with Japan's future will remain an unsolvable enigma. For the sake of Japan's future, I am immensely glad to note that this nation manifested clear understanding of naval problems in the recent London pourparlers.

Our delegates, knowing that the navy has nationwide backing, have been able to stand in accordance with their convictions. The navy knows that the nation understands it is the real problem, on the solution of which hinges the fate of the Empire.

Rail Link at Shanghai

Work has been started on a branch railway line linking the Civic Center with Kaochiangkiao Station along the Shanghai-Woosung Railway, it was disclosed to-day.

Covering a distance of approximately two kilometers, the railway, when completed, will considerably improve communication facilities for the Civic Center. The cost of construction is estimated at between $40,000 and $50,000.

The project is fruit of lengthy negotiations between the Ministry of Railways and the City Government of Greater Shanghai. Under present arrangements, the Ministry will meet the cost of construction while the City Government will provide the lands on which the new tracks are to be laid.

The railway will be completed before September in order to meet the heavy traffic expected upon the opening of the National Athletic Meeting next fall. The railway, however, is primarily designed to improve the transportation facilities between the Civic Center and the southern part of Greater Shanghai.

Linking up with the Shanghai-Woosung line at Kaochiangkiao, where trains run at close intervals, the line will put Chapei in closer touch with the Civic Center. The Shanghai station of the line is at Paoshan Road.

A bus service is now running from Chapei to the Civic Center.

The Expansion in Japan

Ambitions in Manchuria

(In the following is presented a series of three articles which were published in the "London Times.")

* * *

THE future in the Far East depends in no small degree upon what is happening in Manchuria. If Japan makes good with the administration of the new State the situation will be stabilized, in that with a contented population in Manchuokuo the position of Japan *vis-à-vis* Soviet Russia will be substantially strengthened. Nor can China in the circumstances have much to say about Manchuokuo if the thirty millions of Chinese resident there are satisfied with the new rulership. In taking possession of Manchuria Japan has risked a quarrel with the whole world and has put many eggs in one basket. To preserve the basket and make the best of its contents will be a test of Japanese character and statesmanship.

To one who entered Manchuria with the Japanese army over thirty years ago and has since followed events there closely the change in Manchuria was so great and so sudden that it had to be seen to be believed. Manchuria remained static until 1931, stewing in her own pre-medieval juice, until the explosion which caused the deposed Emperor of China to become Emperor in the land from which his forefathers sprang. The identity of the new ruler, though picturesquely fitting, is not the essential factor. What is remarkable is the new force which has appeared, instituting modern methods and creating conditions contrasted sharply with what went before. The process is still in the making ; the force behind it is dynamic.

The old Manchuria was a country controlled by a Chinese military clique whose main occupation was to exploit the populace. It shared the misrule common in China proper. Yet whereas in China the outraged peasantry might appeal to a central government and obtain redress, in Manchuria there was no appeal except to the misruling clique and no hope at all of redress. Manchuria became noted as the source of the soya bean, eagerly bought by the world at high prices. With the wealth it produced the Manchurian army grew like a fungus. The clique printed notes and for several years bought most of the beans and paid for them with sheaves of the notes. The beans were then sold for good silver. The proceeds were spent on filibustering in China. Extremely little went to the banks that issued the notes and ought to have had the silver to meet them, so in the end the peasantry got next to nothing for the beans.

The Japanese Claim

Robbery on this scale has seldom been exceeded. It succeeded because the Government was unprincipled and the law of no account. The military régime was responsible for many other abuses and invited disaster. Especially it ignored Japanese claims and failed to foresee the consequences. Whether Japan was right or wrong in taking Manchuria, Manchuria was lost to China mainly because she did not ensure that it was properly administered, not only in the interests of its large and hardworking population, but in accordance with the legal obligation to respect the rights of foreigners. Without condoning the manner of the occupation, it can be said that, since Japan had saved Manchuria for China by fighting Russia, she might justly claim a substantial interest in the land.

The Japanese are setting to work in a large way. They have a genius for organization and they miss no points. Important for them was the possibility that Russia, pushed out of North Manchuria, might launch an attack while the Japanese army was engaged in subduing rebels and bandits in a hostile country. In order to match the Russians, as well as deal with local conditions, they concentrated on railway construction, built new and extended existing lines, and completed the important link which gave them a new approach to the heart of Manchuria through their ports on the east coast of Korea. To relieve the population—distressed by previous misrule, by the subsequent military operations, and particularly by the ravaging banditry of their own fellow countrymen—the currency question was promptly taken in hand. To-day there is only one currency. Manchuokuo notes are guaranteed by silver and adequate securities, and already enjoy public confidence—a revolutionary change that is a godsend to the harassed and downtrodden Manchurians.

Progress has been made in the suppression of rebels and brigands, and the peasantry begin to realize that Japanese troops are there to maintain order. They now give information which leads to the detection of marauders. Taxation of various kinds has been lowered, and it is estimated that official levies which affect the working population are barely half what they used to be. The Japanese desire to have the people friendly ; they have made an effective appeal by giving them good money, by reducing taxation, and by providing increasing security for life and property. If this policy is sustained and amplified the Manchuokuo Government, controlled by Japan, may soon be accepted by the people as an organization working in their interests as well as to the benefit of Japan. When that feeling becomes widely prevalent the Japanese will have no fears of what might happen in their rear if there should be war against Soviet Russia in the future.

An Economic Paradise

Japanese policy goes indeed farther than the mere placating of the populace. It is intended that Manchuria shall be an adjunct to Japan which shall substantially increase her power and wealth. France has always feared Germany, for historic reasons. A somewhat similar feeling about Russia has existed in Japan, especially since Russia adopted Communism, a political creed inimical to the Imperialist and capitalist system of Japan. Japanese military policy has been to maintain a powerful army ready if required to take the field against Russia ; and it is not superfluous in these days to remark that the need for military and naval preparation has become all the more insistent since Japan broke away from the League and took an independent line in the Far East. Japan has developed her own islands almost to the limit and requires more territory as a basis for her world power. Manchuria is naturally rich, with wide areas of well watered fertile land, with illimitable forests, numerous coalfields, and mountainous regions which conceal unknown mineral wealth. Gold is present at many points and has never been scientifically worked. For the millions of uncultivated acres there is an endless supply of farming labor in China, which is again streaming into Manchuria regardless of the political relations between the two countries.

The Japanese are determined to make an economic paradise of this region where conditions are so favorable. And if the former irresponsible régime could extract wealth from it—to be wasted—what may not be done with it by a Power which uses scientific methods and guards against dissipating revenue on unproductive purposes ? In 1931 the Manchurian forces numbered several hundred thousand, costing a great deal for upkeep. At Mukden there was one of the biggest arsenals in the world full of modern machinery producing munitions, an institution which required vast sums to establish and maintain. Yet when the crisis came troops and munitions were of no avail. The whole military establishment was a dead loss to Manchuria. The Japanese have planned to make Manchuria prosperous and productive of a large revenue, part of which will be used to pay the cost of the Japanese army garrisoning and protecting Manchuokuo. That army will remain Japan's outpost against Soviet Russia. If Manchuokuo prospers, it will cost Japan nothing. Obviously Japan has a great deal to gain by transforming Manchuria into a going concern. That she is in earnest in trying to do so on a large scale and on practical lines is evident from a scrutiny of the plans envisaged for the territory.

In order to avoid giving the impression that all is going swimmingly it should be said that the Japanese are encountering various difficulties, chiefly in completing the suppression of brigandage, partly in restraining undesirables of their own nationality. That some abuse of power and opportunity by some Japanese is admitted indicates at least that the evil is recognized and will be taken in hand as speedily as possible. On the other hand, the financial outlook is better than expected, mainly on account of the increase of the revenue from Customs and the larger collections of taxation resulting from greater security and improved trade.

The "Open Door"

The "open door policy," an invention of Western statesmen for ensuring commercial access to Oriental States, does not prosper in the Far East, although both Chinese and Japanese subscribe liberally to it on paper. In Manchuokuo it is politically fundamental, in practice a mere negation. Chinese business concerns are more or less under the supervision of Japanese advisers. How can they be expected to buy foreign goods, even though they may prefer them, when Japanese products of the same kind are available, probably at less cost?

The ultimate security for trade, property, and life in Manchuokuo is the Japanese Army of Occupation; and it is obviously impolitic, even reckless, for buyers to think of looking beyond Japanese goods. Even when the things required are not made in Japan and have to be brought from some other country, the foreign agent in Manchuokuo may fail to secure the business, as there are big Japanese importers in Japan who can sell the products of all countries as cheaply, and deliver them as promptly, as the agent of the original manufacturer.

The Manchuokuo Government contemplates the institution of monopolies in certain foreign products, but, since it has recognized the validity of all foreign treaties which applied to Manchuria at the time of the Japanese occupation, the question arises whether Manchuokuo can go back on treaties which stipulate equal opportunity, and no exclusion of or preference against foreign imports. Manchuokuo is a State which has not been recognized by foreign Powers—El Salvador conspicuously excepted—hence other countries are not in a position to make representations. Japan has, however, given similar assurances as regards the foreign treaties and can be invited to explain why a country of which she is in military occupation can ignore pledges to observe international engagements. This is a matter of much importance to foreign trade, and the Powers interested will of course give it their assiduous attention.

Principal Monopolies

The first monopoly will be oil. Another, as soon as the Manchuokuo Government finds it convenient to create it, will be tobacco. Great Britain and America are particularly concerned with both these commodities. A large oil refinery is being erected at Dairen. It is understood that Manchuokuo will declare oil a State monopoly and entrust management to a company, part of the shares in which will be available to the public, but the majority will be held by the Manchuokuo and Japanese Governments. The importing of the principal classes of manufactured oils, kerosene, petrol and lubricating, will be forbidden; but the company will import crude oil, which will be refined as required and sold at prices fixed by the Government.

Purchases of crude oil will be made from the big concerns now supplying the manufactured articles, so that, while deprived of the profits of manufacture, they will still have the opportunity to sell their raw product. Manchuokuo expects, however, to mine its own crude oil, as there are places where seepage suggests the possibility of oil in commercial quantities. There are also the shale deposits at Fushun, from which oil is already being extracted. There the output can be increased almost indefinitely. The shale product is of poor quality, while the various indications of oil have yet to be proved profitable. The big oil companies will therefore continue business as usual until it is seen to what extent the refineries at Dairen and Fushun can meet requirements and in what degree crude oil is available within the territory.

There is also a declared Manchuokuo-Japanese monopoly in gold-mining, but it is stated that foreign concerns will have the opportunity to operate in specified areas fixed by agreement. A new mining law was promised for July 1, but is not yet published. A number of foreign mining representatives are now in Manchuria waiting to see on what conditions they may engage in this industry, and the indications are that the monopoly will retain for its own operation all the best-known locations and leave the less promising ones to applicants of any nationality. Some foreign concessionaires, whose rights pre-date the establishment of Manchuokuo, claim the right to resume operations under the Manchuokuo declaration that all the engagements of the previous Government with foreigners shall be respected. The presence of gold is indisputable, and the fact that it is profitably mined in north-east Korea, in geological formations which correspond to those in the neighboring country, encourages prospective investors. The Japanese, in whom there is a strong speculative vein, are even hopeful of discovering another Johannesburg; but all the gold hitherto found has been alluvial, in spots soon emptied of their precious deposit. It has still to be proved that scientific mining on a large scale can be made to pay.

The Opium Law

The opium monopoly established in 1932 was stated to have as its object the control of cultivation and the confining of consumption to approved addicts, the end in view being the ultimate extinction of the traffic and the eradication of a pernicious habit. The law prescribed that certificated applicants would be supplied at licensed premises and that no one without a certificate would be supplied at all. In practice, however, in certain centers, it appears that large numbers of duly licensed houses sell opium unconditionally. In some places it is believed that cultivation is actually being officially encouraged. The temptation to seek revenue from so prolific a source on the part of a Government that urgently needs funds for constructive and other public purposes is understandable; but such an expedient in a Government controlled by Japanese seems highly inconsistent with the policy pursued in Japan itself, where the use of opium and all its derivatives is strictly prohibited except for purely medicinal purposes.

There is ample evidence that Manchuokuo is pushing ahead economically. Hsinking, the new capital, is a hive of activity and already possesses many fine buildings; many more are in course of erection. All the main streets of the new modern district and of the old town have proper roadways. Motor-cars are common. Several aviation services are in operation. Railway time-tables have been accelerated. In contrast to the old slow-motion journey up and down Manchuria, the S.M.R. trains are now recording 50 m.p.h. Hotels are full of well-dressed Japanese connected with trade and various enterprises. The immigration of Chinese coolies was much reduced in 1932, but increased in 1933, and for the first four months of 1934 was nearly 300,000. How many will stay after the harvesting is over remains to be seen.

Activity in Manchuokuo expressed by the volume of shipping, by the increased imports, and by the traffic on the railways, is largely due to the free expenditure of Government money on public works and buildings; yet the impression on visitors is that the country is recovering from the setback induced by events in 1931 and 1932 and is returning to normal. The normal now excludes strangling official exactions, but gives the farming population a chance to get on their feet again and resume purchasing foreign essentials, like kerosene, and luxuries, like cigarettes. The fact that many large enterprises are being started, officially and privately, indicates confidence in the future and readiness to support it by the investment of money.

All important Japanese in Manchuria, military as well as civilian, emphasize the necessity of establishing good relations with the people. Official orders are that the troops shall pay for all requirements and for billeting when on the march, and in all departments Japanese are expected to be friendly and helpful to their Chinese and Manchu colleagues. One of the difficulties is that the old style officials do not take readily to modern methods. Fixed budgets and a rigid audit system are strange to them and without doubt the majority would prefer the old system by which small salaries could be supplemented when opportunity offered. Manchuokuo salaries have been fixed at a level intended to obviate the necessity for irregular commissions and for the time-honored squeeze, but on the whole the strict control exercised by the Japanese employed in the General Affairs department is not popular, and not likely to become popular in the near future.

What applies in official circles holds good in greater degree in general dealings with the people. The Japanese are regarded as over-masterful and often quite regardless of the feelings and ordinary human rights of the Chinese, among whom they have come uninvited and by force. The peasantry probably have little anti-foreign feeling—except where they have been positively ill-treated by newcomers—and are believed to be responding to Japanese endeavors to protect them from bandits and otherwise to treat them well. In the end, if they are fairly taxed and their property is respected, there is reason to think that the peasantry will accept the new government with equanimity.

The truth is that some Japanese elements in Manchuria are giving the Japanese authorities a good deal of trouble. In one of the military settlements the colonists behaved so badly that they were attacked and the military guard sent to protect them was slaughtered. It turned out that the colonists selected were mostly the bad characters of the districts of Japan from which they came. Manchuokuo, having found these colonists an expensive luxury, then wanted to have them deported, but apparently their home districts objected to taking them back. The Japanese are a people of strong character. If a man is an undesirable he is usually dangerous. A result of the behavior of this type during the Shanghai affair of 1932 was that the Japanese authorities deported several hundreds to Japan. There are many such in Manchuria. They are damaging the Japanese reputation for humanity and fair dealing.

Nor are the soldiers and sailors always above reproach. Unjustified violence is often experienced at their hands, as Shanghai knows well. These young men, usually country-bred, are so imbued with the importance of their own country and with its natural right to exercise mastery throughout the Far East that they often cannot refrain from asserting themselves and demonstrating their superiority. This weakness is well known to Japanese in authority and is a constant source of anxiety to their officials in China. The root of the trouble is the unrestrained nationalist spirit engendered in Japan. Unless some means of keeping it within reason is devised Japan is liable to have difficulty in gaining the good will of the population of Manchuria and in establishing better relations with the people of China.

The Japanese aim of establishing a new State in Manchuria entailed economic reorganization in many directions. Among the important fields to which the Japanese authorities turned their attention were the rehabilitation of the currency, the expansion of trade and cultivation, and the development of the railways.

One of the outstanding evils in Manchuria was the flood of depreciated notes, ruinous to the cultivators and causing loss to all in the country, including foreigners. All the issues were declared illegal except those which had some market value. The 15 categories left in circulation were given a fixed ratio with the new Manchuokuo dollar, and the process of exchanging these for the new notes is now practically complete. The new notes represent silver, but silver cannot yet be demanded for them. The total in circulation is about $140,000,000, against which silver and gold are in reserve to the extent of 61 per cent, the balance being secured by bonds of the Manchuokuo Government. For exchange purposes the Manchuokuo dollar is on a par with the Chinese dollar, but at a premium of 10 per cent in regard to the yen, which indicates that the new currency has foreign as well as local confidence. The ultimate value of the notes depends upon the credit of the Manchuokuo Government.

The question of communications was important and complicated. There were three categories of railways, those belonging to foreigners (South Manchuria Railway and Chinese Eastern Railway), those built with Chinese capital, and those built for the Chinese Government with Japanese capital. For railways under the last category China owed, with compound interest on outstandings, about $170,000,000. Payments for interest and amortization had been negligible, although some of the lines were being run at a profit. It was finally arranged that Manchuokuo should take over all such lines at $130,000,000, giving bonds for that amount to the creditor, the S.M.R. Company. Manchuokuo then handed over all the railways, those purely Chinese and those built for China with Japanese capital, to the S.M.R. to be managed as one concern on her behalf, an arrangement which assures efficient control. Incidentally a section of the British-built Peking-Mukden line is included in the new organization, but the British claim has been recognized, and regular and more than adequate payments have been made since the section was taken over.

Strategic Railways

The new lines built and under construction are of great strategic and commercial importance. The failure of the Chinese to carry out the agreement for a line from Tunhua to the Korean frontier was one of Japan's great grievances, but the connection is already made and in operation, and this route is now the shortest between Japan and Manchuria, and particularly valuable from the military point of view. A little west of Tunhua is Lafa, from which there is a new direct line to Harbin and Hailun, beyond which an extension is under construction to Heiho, on the Amur, nearly opposite Blagoveschensk. This extension is also of military interest, for the terminus will be within striking distance of the Amur line, the only Russian railway connection with the Pacific coast.

Hsinking is being joined up with Talai (Petuna) and Taonanfu, while an extension, originally started by the Chinese, is under construction to Solun, well into Mongol country, whence further extension towards Russian and Outer Mongolian territory is possible in the future. The double extension from Chaoyung into south and north Jehol will give access to the port at Hulutao, now under construction by Manchuokuo, and opens the way towards Chinese Inner Mongolia. Another significant line under construction is that from Tiumen to Mutankiang, on the C.E.R., and north to Chamuchi, which leads towards the north-east section of Kirin Province, which is bordered by Russian territory. During the first two years of operation under the new organization the Manchuokuo railways made a good profit and are estimated to have a net balance of $20,000,000 in the current year.

Raids by Bandits

Banditry has always been a popular profession in Manchuria and is not likely to die out in a hurry. The large-scale banditry which the Japanese troops were combating at the beginning was not the indigenous variety, but a special growth resulting from hordes of the Manchurian troops being left without pay, rations, or quarters. Those with leaders became rebels and did a good deal of honest fighting until they realized that they were no match for well-equipped forces supported by artillery and aeroplanes. When large regular bodies were defeated and dispersed they broke into bands which had no choice but to live on the country, and much havoc they did. The so-called bandits numbered, perhaps, 150,000 in 1932, but are now reduced to about 40,000. Most of the open country is now free of them, but strong bands still have their lairs in difficult country and make vicious raids. There is no doubt that much of the raiding has the object of harassing the Japanese forces as well as of acquiring loot, and Communists and Chinese are suspected of giving support with money and munitions. Nevertheless, brigandage is now confined to restricted areas and causes the Japanese no real anxiety though a great deal of trouble.

A brighter side of the picture is the financial outlook, which is improved by the larger revenue from the Customs. For 1932-3 (July 1 to June 30) collections were $22,000,000, and in the following year $49,000,000, while the Budget estimate for 1934-5 is $72,000,000. Internal taxation rose from $8,000,000 to $38,000,000, and the Budget estimate for the third year is $46,000,000. Under expenditure the new Budget estimates $2,000,000 for the Imperial Household, $45,000,000 for General Affairs (the Japanese Supervisory Department), $32,000,000 for Civil Affairs, $58,000,000 for Defence, $23,000,000 for Finance, $8,000,000 for Justice, and $6,000,000 for Education, as compared with less than $1,000,000 expended during the past year. It is understood that Manchuokuo will furnish $9,000,000 as a first contribution to the expenses of the Japanese forces.

A notable feature of the affairs of Manchuokuo is that while exports from Manchuria for many years enormously exceeded imports in value, the balance is now adverse. Thus Manchuokuo has to pay out, or borrow to make up the deficiency. The reduced value of exports is due to the heavy fall in the price of soya and its products resulting from the world depression. On the other side of the account imports are greatly increased owing to large purchases of materials for Government buildings and for establishing official and private Japanese enterprises, while there has been a great increase in the import of American flour, though wheat was formerly widely grown in the country. The adverse balance exercises the financial authorities, and efforts are being made to restore equilibrium. The Government aims at lowering the production of soya and increasing the cultivation of wheat and rice,

Manchuokuo A Going Concern

American Red Cross Delegate Finds New State Has Reasonable Chance of Gaining in Stature

(Mr. Wadsworth, the writer of the following article reprinted from "The New York Herald Tribune," was formerly Assistant Secretary of the U.S. Treasury and was a delegate to the recent International Red Cross Conference in Tokyo.)

* * *

THE most casual visitor to the Far East must be impressed with the tremendous changes already made and in progress. The so-called impact of the West is no imagination. Its very tangible results are of tremendous importance to all the world, particularly to the United States.

Japan, Manchuokuo and China show great development, rapid in Japan, slow but sure on the mainland. Japan's industries are growing in volume and diversity. There seems every probability that China and Manchuokuo will follow the same course, but perhaps more slowly.

American business is already affected in many fields. American textile mills are facing competition from up-to-date plants in Japan and Shanghai, operated with cheap labor and low taxes. Cotton from China, India and Egypt is replacing American cotton in these mills. Cotton sales across the Pacific are already declining.

Other Products Affected

Another typical example of competition is in hardware, formerly largely bought in America, now made in Japan for a fraction of its import cost. In rayon, shipbuilding, chemicals, electric machines, bulbs, tools, aircraft, engines, paper and wood pulp, America is facing a tireless and ingenious competitor with modern machinery and extremely low labor costs.

The other side of the picture is the possibility of increasing American sales of both raw materials and finished goods in Far Eastern markets.

Evidence of Japanese progress and energy is on every hand. Tokyo and Yokohama, with more than 5,000,000 inhabitants, have been rebuilt from the ground up since the earthquake of 1923. All over the country there are well paved streets, excellent street railways, electric light, power, water supplies, traffic control universal cleanliness. The Japanese Red Cross is a leader in hospital development. Railroad service is exceptionally good. Radio antennæ are part of every landscape.

No one can doubt the energy and ability required to plan and install all these improvements in the equipment of the nation in fewer than seventy years. The individual seems to be naturally a worker. He pulls a loaded cart, does manual labor, runs a department store, railroad or bank with every appearance of wanting to make good. The simplicity and economy of living is startling compared to easy-spending America.

Through all the scheme of things in Japan runs an intense nationalism and unity of purpose, directed by a strong central government. General Araki, former Minister of War, described the Japanese government in these words: " Ours is the unity of ruler and ruled. We look upon the nation as a family. We consider the art of government to be co-operation of the people and the Emperor for the common welfare."

Nations are sometimes spoken of as powers. The Japanese nation is surely a power. Those who guide its course in world affairs have a vast responsibility in the family of nations, particularly in the Far East.

Not All Bed of Roses

I would not convey the idea that Japan rests on a bed of roses, and has no problems, for there are serious problems. An increase in population of nearly 1,000,000 a year is cause for uneasiness. There is general talk of birth control as a national need. The financial situation is none too easy—a large deficit in the budget, the national debt increasing, the banking and economic structure depending more and more on the success of new markets and ability to export.

Raw material, cotton, wool, coal, iron and rice must be imported in increasing quantities. A growing foreign market is becoming a necessity to the very life of the nation. A decline in sales abroad could cause great unemployment and inability to pay for essential imports.

As elsewhere, there are politics and poverty. At the moment, the farmer is demanding relief because of low prices for silk and rice.

Some observers think that Japan is where America was in 1928—over-extended, unbalanced between agriculture, industry and capital, with a dangerously high stock market. This is perhaps too pessimistic a view, provided that no incident develops, such as war, a boycott against Japanese goods or international money troubles.

Manchuokuo's Progress

The creation of Manchuokuo out of what was about 10 per cent of China has been the subject of endless controversy. A visitor could hardly doubt that it still exists. There are 30,000,000 people with a central government and 400,000 square miles of territory. Agriculture thrives, factories and mines operate, railroads and roads are being improved and extended, electric power consolidated into the great unit and the oil business taken over by a government monopoly. There is a new central bank, a national currency selling at a premium over Japanese yen. Education is being organized and extended.

Japanese management and capital are much in evidence, with every apparent intention of staying so. While diplomatic recognition is withheld, agreements are being made with neighboring countries to cover postal service, railroad traffic and customs. Manchuokuo gives the appearance of a going concern with a reasonable chance of gaining in strength and stature.

China, with a population of some 400,000,000, is a great contrast to Japan. Eighty or 90 per cent of the people are illiterate. There are few railroads and roads. Organized industry hardly exists except in Shanghai and a few other cities. The banking and currency systems are not too strong. The export of silver dollars caused by the rising price of silver threatens serious consequences. There is room for improvement in every public facility.

When Western ideas appeared in the East the Japanese government and people accepted them. By national planning and action they adopted Western methods with the greatest possible speed. In China not only the government but tradition and conservatism resisted change. Western ways have come only slowly, one thing leading to another.

For example in Peiping life has been greatly changed by the asphalting of many important streets where for centuries inches of dust or oceans of mud made transport always difficult. Now some automobiles and swarms of bicycles use the paved streets and cause demand for more. The ricsha and handcart, once great employers of labor, are hard pressed by this competition. Street lights and traffic policemen followed as a necessity.

Perhaps the revolution of 1911 marked the real beginning of change in China. When the Emperor had to go all the thousands of useless office-holders, an immense bureaucracy, built up in centuries around the court, went, too. The conservative gentry was largely swept away in the chaos which followed.

Civil War's Ravages

There was no one at hand to seize the reins of power, as did Lenin in Russia and Mussolini in Italy. A struggle began between war lords and Communists; tearing the nation apart ensued. For twenty years civil war in one part or another of the country has broken down what government system there was of postal service, police and law. Railroads were stopped, bridges burned, roads blocked and commerce dislocated. The loss of life and property is incalculable, a large area in Mongolia has gone to Russia and 10 per cent of Chinese territory is split off to form the new State of Manchuokuo.

The peasants, more than 80 per cent of the population carried on with their farming, but during this period in the cities a new

(Continued on page 30)

The Menace of the East

By SIR JOHN POWER, M.P., in the "Yorkshire Observer"

The menace of Japanese competition is assuming such alarming proportions and increasing so rapidly that any figures in regard to Japanese exports are out of date almost as soon as they are published. The latest figures available show that, while the trade of the world has sunk to one-third of its volume in 1929, Japanese exports have actually increased in volume. Comparatively speaking, this means that Japanese exports are at least three times as great as they would be if Japan had suffered from the world depression equally with other countries.

The best we can do is to find the underlying reasons for the amazing expansion of Japanese exports into every market in the world, which has raised the deepest misgivings and consternation in certain sections of the highly-industrialized nations. No such expansion of trade has ever taken place before, although our own expansion during the period of what is called the "Industrial Revolution" has been called into comparison.

At that time, however, Britain became the workshop of the world, but an agricultural world, and the fact that she was able to supply manufactured goods to agricultural peoples in return for food and raw material rather gained her credit for supplying peoples with the greater amenities of industrial civilization without depriving them of the means of subsistence.

Japan is the first of the Far Eastern countries to capitalize and employ its low standard of living in the development of a scientifically-calculated invasion of the markets of the world, irrespective of whether they be in the East or the West. It is a mountainous country, but, nevertheless, with a rapidly-growing population which it cannot feed itself from its own natural resources. It is this fact which is the driving force behind Japanese industrial expansion.

In 1872 the birth-rate was 17 per 1,000. It is now some 34. In 1930 the population was 64.4 millions, an increase of 5,000,000 in five years. Opinions differ as to whether this increase of 1,000,000 per year will continue, but a paper by the well-known Professor Uyeda gives the number of births in Japan as more than 2,000,000 per annum.

Whatever the population may be in the future, the number of people already alive between 15 and 60 years of age will increase during the next 20 years by 10,000,000, and the problem for Japan is how to find them employment and food.

It is estimated that to feed 500,000 people would require 2,500,000 extra bushels of rice, or an output of some 70,000 acres of land. Japan, however, has practically reached the maximum of its territory that can be cultivated with rice, and has only been able to add some 25,000 to 35,000 acres during the last 20 years, although, by sinking artesian wells in some of the higher altitudes, a certain amount may yet be brought into cultivation.

Japan has, therefore, only two ways open to her to feed her hungry multitudes—emigration or industrialization. Emigration on a large scale is practically impossible by reason of racial antagonism and anti-emigration laws. Even in Manchuria, on which she has had a hold for so many years, the population of Japanese to-day only amounts to approximately 200,000, whereas there are about 800,000 Koreans and some 28,000,000 Chinese. The Chinese standard of living is even lower than the Japanese ; moreover, the Japanese cannot stand either extremes of heat or cold as can the Chinese.

Japan's position is not a happy one, for she has no iron or coal, and her output of oil has steadily diminished since her peak year of 1916. She can only industrialize herself by importing these vital materials on a large scale, and she can only pay for them by her domestic exports. She cannot reduce her imports without a corresponding diminution in her exports.

She has entered upon her scheme of industrialization with an amazing and painstaking labor for which her people are so justly celebrated, and every means is taken to undersell her competitors. She is gradually extending and widening her range of manufactured goods for export. To enable her to do this the yen has been depreciated as part of a national sales policy, and this, coupled with low wages, has been disastrous to British and other trades in the world's markets.

Rayon

Even two years ago she stood third in the production of rayon or artificial silk, her exports having increased ninefold in five years, and this despite the fact that our rayon industry is up-to-date in both method and equipment.

Her competition is felt in such diverse ranges of goods as heavy chemicals, electric lamps, cycles, buttons, cement, and, to an extraordinary extent, in rubber, boots and shoes. Her ability to undercut all competitors is due, first, to low wages resulting from a different standard of life, estimated to be not more than one-third of the Western standard, and, secondly, to Government action in the form of exchange depreciation subsidies, and freight dumping.

The Japanese Government first started Japan on the industrial road by providing factories, importing machinery, engaging foreign experts, and working the factories until they were established and then handing them over to private enterprises. During this period they were supported by Government subsidies, special tariffs, and eventually, by guaranteed profits. The manufacturers of certain stable commodities were exempted by special Imperial orders from payment of income tax on their first four years' profits. In 1925 the Government gave a foundation grant or subsidy to help in the formation of guilds or associations for the export manufacturer.

Cartels or similar organizations have been formed in nearly every industry and have given Japanese exportation a cohesion and elasticity that is almost all-embracing. Price-cutting and zoning of markets are thus co-ordinated into a national export drive. Travelling inspectors are sent all over the world to find openings for Japanese goods. Co-ordination of shipping and its subsidy are used in the undercutting and underselling of competitors.

Except in the years 1915-18 and 1920 subsidies have exceeded net earnings, while in certain years only the Government subsidies have prevented heavy trading losses.

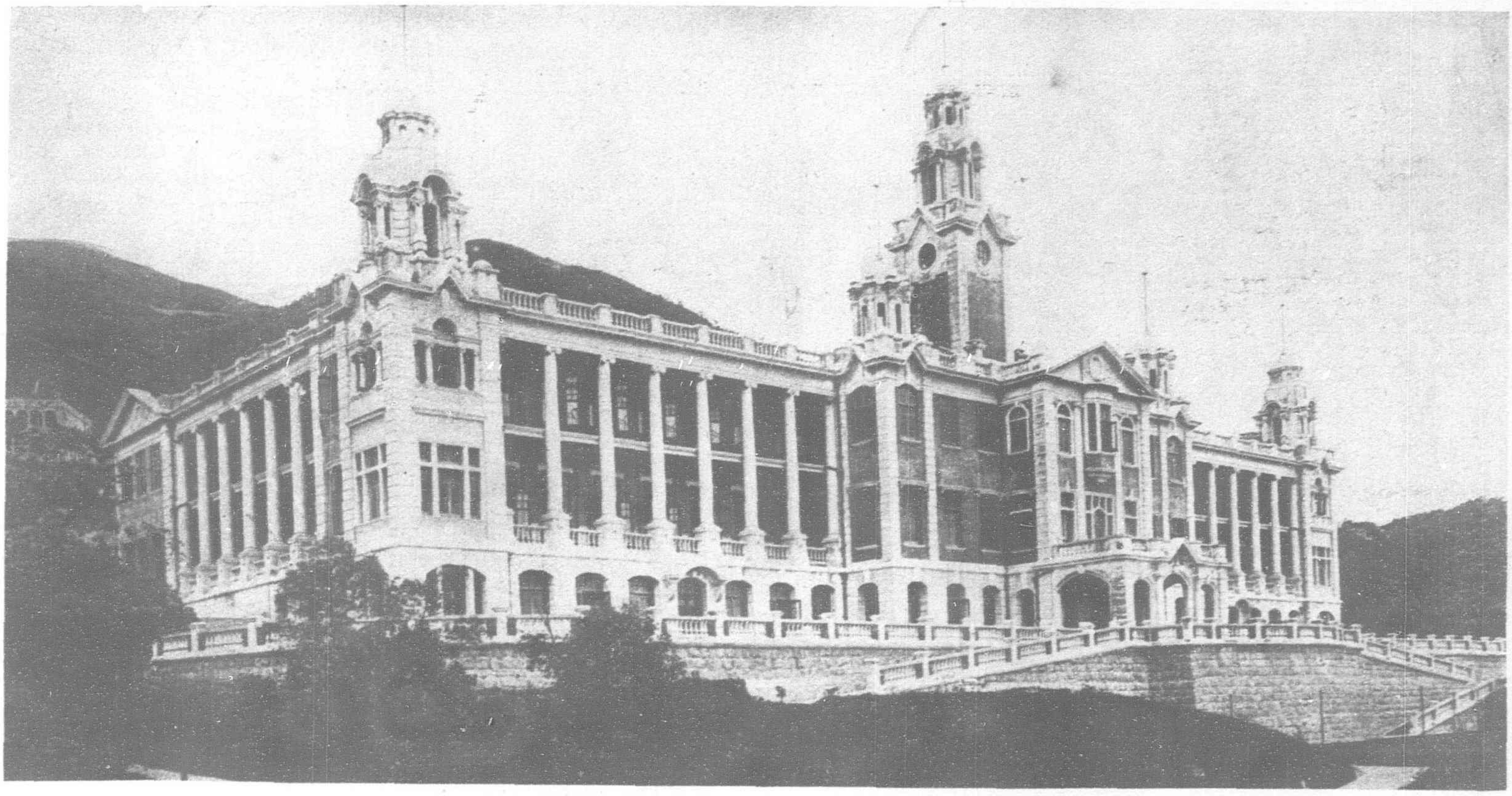
Comparisons

It is difficult to make a comparison between British wages and Japanese wages that will cover all industries, but it may be taken that, with the yen at par their female wages are one-quarter and male wages one-third of the British in the textile industries, and these wages for very much longer hours than our operators work. These figures, however, do not apply to the small sheds or factories run as family concerns, of which there are many thousands who pay definitely lower wages.

Japan has found in the agrarian districts an almost illimitable supply of girl labor, docile and possessed of great manual dexterity, that quickly becomes expert in running either spinning or weaving machines. Workers look after more machines than is permitted in Great Britain, particularly in the weaving section, and, while the speed of looms is somewhat slower than in Lancashire the net output per operative is considerably greater. The Japanese run on a two-shift basis, thus reducing overhead charges.

From the foregoing it will be seen that tariffs are of little use in meeting Japanese competition seeing that, with the depreciated yen, the wages in some of our industries are five to five-and-a-half times greater.

While one sympathizes with the unfortunate position in which Japan finds herself some means must be found of allowing our great textile industries to maintain their existence and not succumb in competition arising from a low standard of living only possible in a climate similar to that of Japan.



Main Building of the University of Hongkong from a Northern Aspect

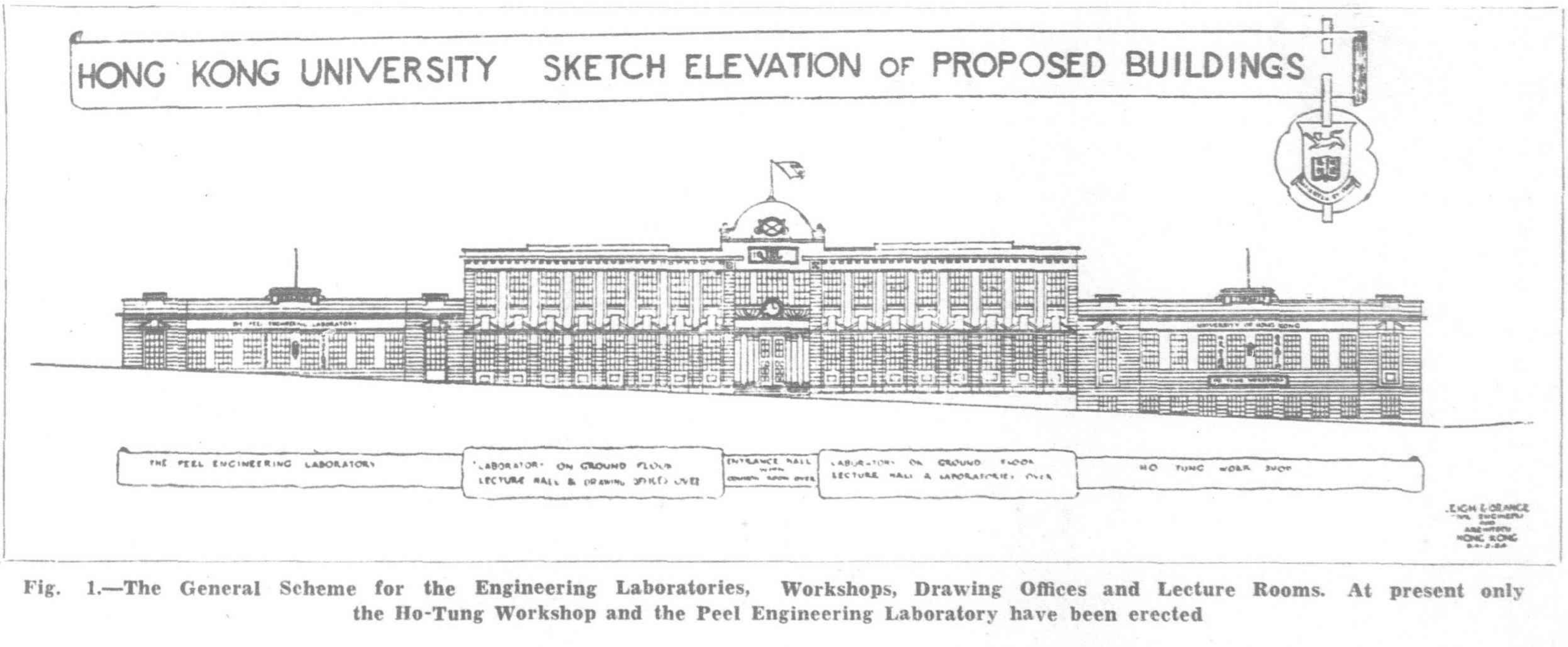
The Peel Engineering Laboratory at the University of Hongkong

By LI KAI YEUNG, B.Sc. in the "Hongkong University Engineering Journal"

THE latest addition to the Hongkong University Engineering Buildings is the new Peel Engineering Laboratory in which will be housed all of the internal combustion engines, the steam engines, the turbine engine and boilers, the air compressors and the refrigerating plant. This new building is situated to the west of the Ho-Tung Workshop and will form an extreme wing of the complete Engineering Buildings (Fig. 1) which it is hoped will be finally erected during the next few years.

It is a great encouragement to learn that H.E. the Chancellor of the University has given his consent for his name to be permanently associated with the Engineering Faculty of this University.

During the whole period of his residence in Hongkong, Sir William Peel has taken a very deep interest in everything connected with the University; he has also been intimately associated with many engineering developments in Hongkong. Not only has he visited works undertaken by the engineers in the Public Works Department of the Government but he has also inspected many



HONG KONG UNIVERSITY SKETCH ELEVATION OF PROPOSED BUILDINGS
THE PEEL ENGINEERING LABORATORY
LABORATORY ON GROUND FLOOR LECTURE HALL & DRAWING OFFICES OVER
ENTRANCE HALL WITH COMMON ROOM OVER
LABORATORY ON GROUND FLOOR LECTURE HALL & LABORATORIES OVER
HO TUNG WORK SHOP
LEIGH & ORANGE
HONG KONG

Fig. 1.—The General Scheme for the Engineering Laboratories, Workshops, Drawing Offices and Lecture Rooms. At present only the Ho-Tung Workshop and the Peel Engineering Laboratory have been erected

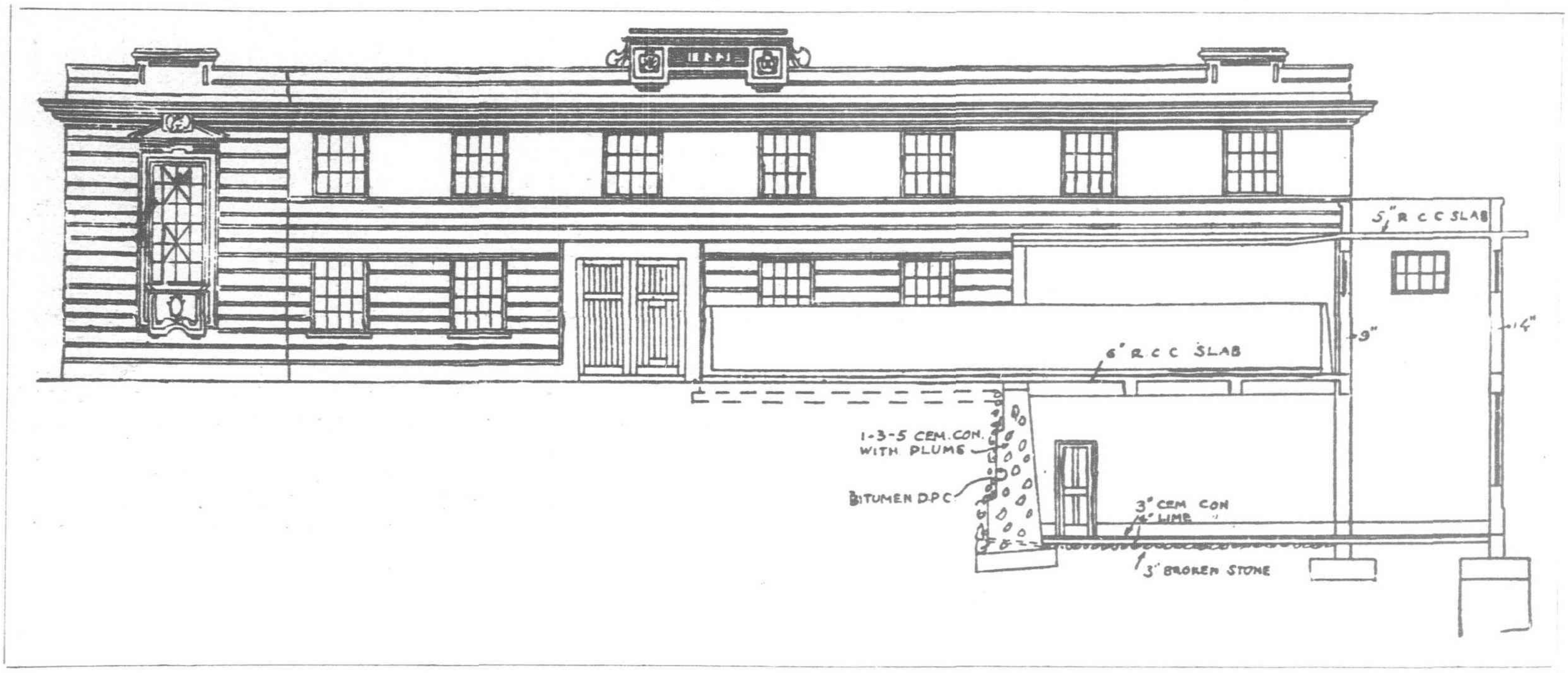


Fig. 2.—The Peel Engineering Laboratory side elevation and section

types of local engineering work carried out by private enterprise. He is an Honorary President of the Institute of Engineers and Shipbuilders of Hongkong and at the last annual dinner he made appreciative references to the work carried out by engineers in the Far East. On that occasion he explained that his best subject of study in his youth was mathematics which subject he suggested is allied with the science of engineering. It is hoped that H.E. the Chancellor of the University will consent to open officially the building which has been named after him.

General Arrangement

The Peel Engineering Laboratory has been erected at an estimated cost of $70,716.35 (annual report of the University of Hongkong, 1932-1933). It occupies about one quarter of the area allocated for the complete Engineering Buildings. The site was formerly military land and was presented by the military authorities to the University. The late Sir Claude Severn once humorously referred to it as "the wilderness of Cades" (a place mentioned in the Bible) because Professor Cades Alfred Middleton Smith first approached the owners with the suggestion that the land be presented to the University.

In addition to the ground floor, where all engines, compressors, etc., are placed, there is a basement under the north side of the ground floor, equal in area to one quarter of the space above. There is a separate boiler room, an annexe to the east of the building. In this basement a drawing office is arranged to accommodate thirty-six students.

The side elevation of the building is shown in Fig. 2, and a section through the boiler room and the condensing water tank (shown dotted in Fig. 4). A part of the tank rests on top of the boiler room. This tank measures 13-ft. 6-in. by 45-ft. by 5-ft. deep, and contains 3037.5 cubic feet of water when full to the brim; it is large enough to be used as a swimming pool. The water therein will be sufficient to cool the three condensers for the Marshall steam engine, the launch engine, and the steam turbine.

Additional floor space is provided in the gallery which runs round the inside on the east, west and north sides of the building. This will form the Applied Mechanics Laboratory.

The front elevation of the Peel Engineering Laboratory when completed is shown in Fig. 3, and harmonizes with the front elevation of the Ho-Tung Workshop. In the picture will be noticed an inscription which is a quotation from the Book of Records,—" Water and

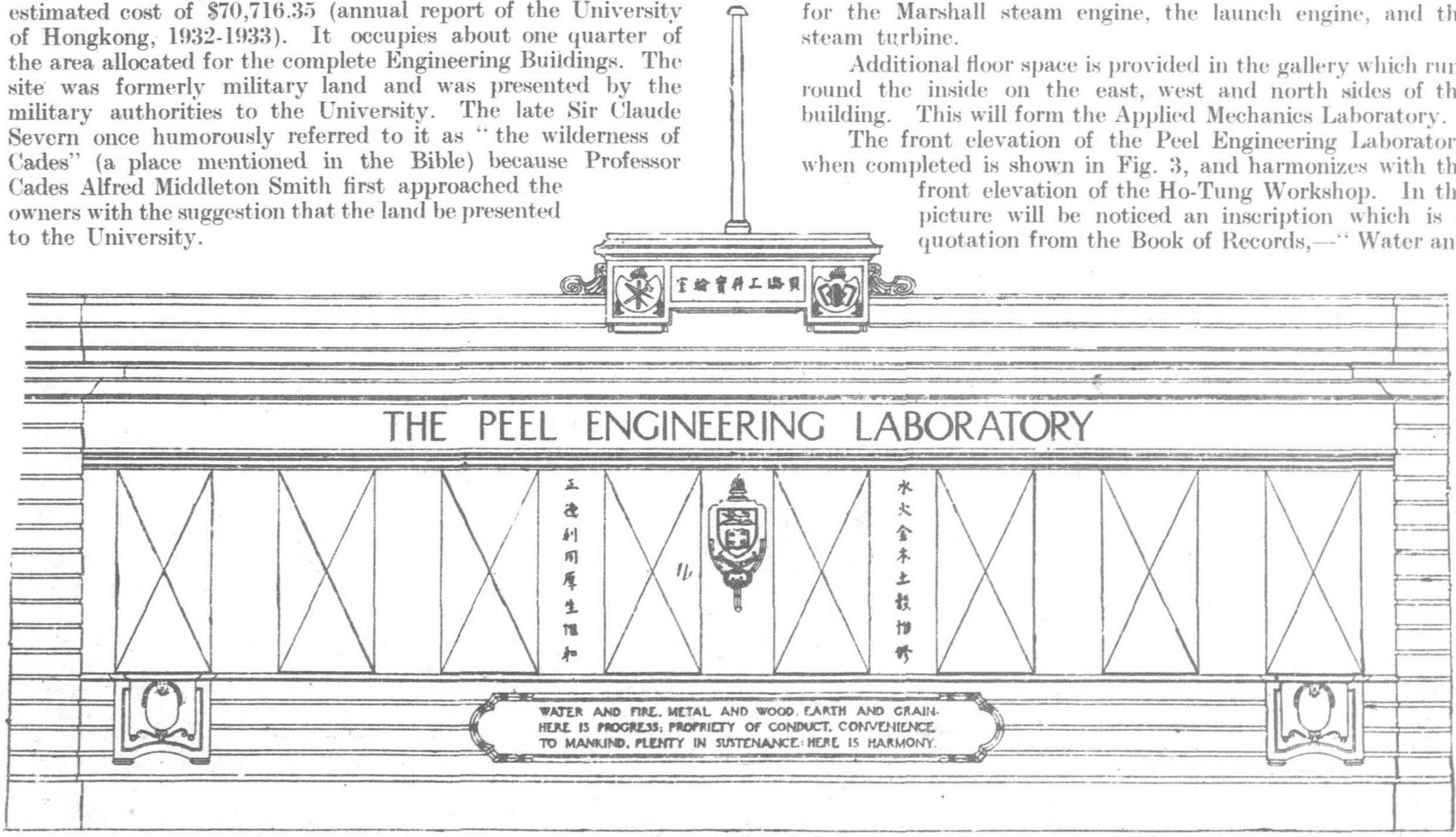

貝路工程實驗室
THE PEEL ENGINEERING LABORATORY
正德利用厚生惟和
水火金木土穀惟修
WATER AND FIRE. METAL AND WOOD. EARTH AND GRAIN. HERE IS PROGRESS: PROPRIETY OF CONDUCT. CONVENIENCE TO MANKIND. PLENTY IN SUSTENANCE: HERE IS HARMONY.

Fig. 3.—The Front Elevation of the New Building for Experiments on Heat Engines, Refrigeration, Air Compressors, etc. (The quotation is from the Book of Records)

Fire, Metal and Wood, Earth and Grain: Here is Progress, Propriety of Conduct, Convenience of Mankind, Plenty in Sustenance: Here is Harmony." It was translated by the late Mr. Lam Tung, B.A., who was one of the victims of the gas-works explosion. We regret to record that this was his last work for the University.

The situation and surroundings of the engineering buildings of the University can be seen in Fig. 4, on a reduced scale.

When the new building was near to completion all of the boilers, engines, compressors, etc., were removed from their old foundations and installed in the new laboratory. This work was undertaken by the Taikoo Dockyard and Engineering Co., of Hongkong Ltd. Through the courtesy of Mr. K. E. Greig, the General Manager of the above company, we have had invaluable assistance, suggestions, inspection and advice from their staff and workmen since the beginning of this removal of machinery. We wish to offer our sincere thanks for their valuable co-operation.

Students' Hostels and some Staff Residences at the University of Hongkong

During transference, all the engines, flywheels, generators, etc., were taken to the new building in lorries, only small and sundry parts being carried by coolies. Previous to each transfer, sufficient parts of engines were shifted outside the old power station and left in the path on the east side of the University main building for the night until the next morning. The days following each transfer were occupied in dismantling other engines and moving them outside ready for the next transfer. Sheer-legs were erected and lifting tackles used for the raising and lowering in place of all heavy parts. The latter were supported on wooden blocks fastened by clips and the whole hauled on or off the trucks by pulley blocks. During the weeks of removal and erection of the power plant, full supply was maintained to all motors, etc., in the University workshops and laboratories.

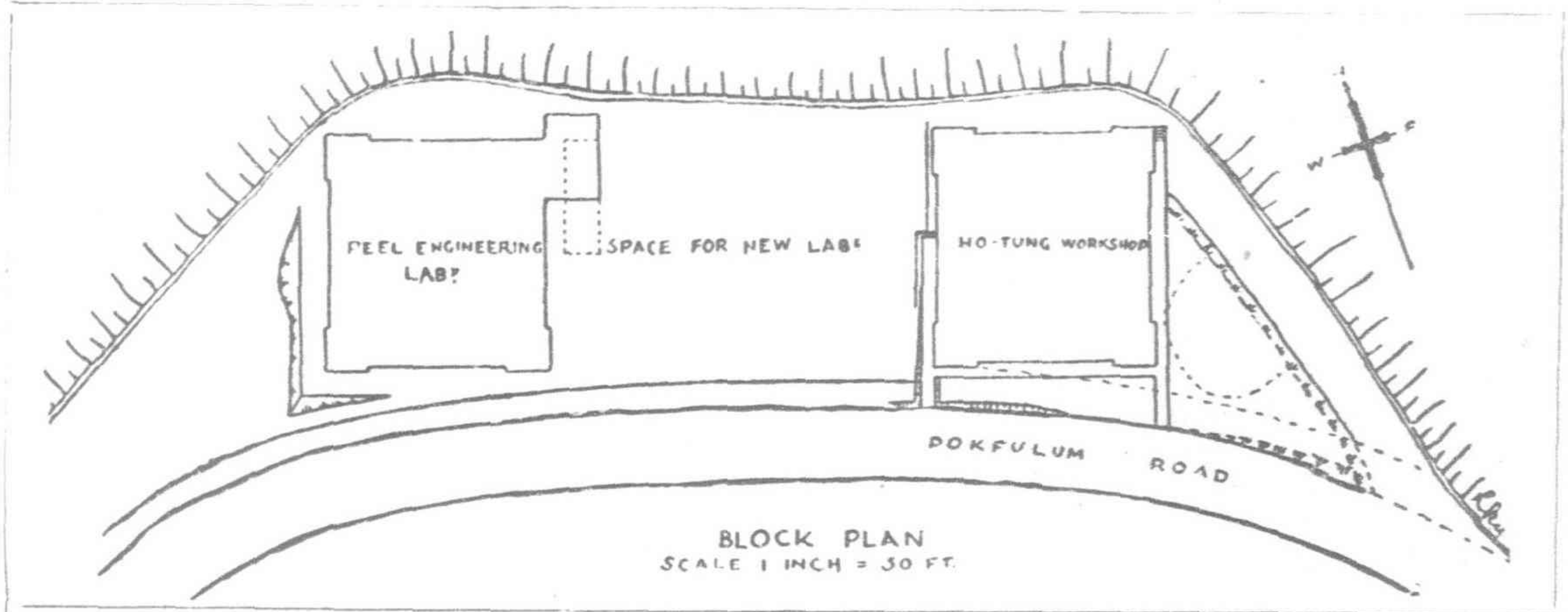


Fig. 4

The Equipment

In the Peel Engineering Laboratory there are housed the following engines:—

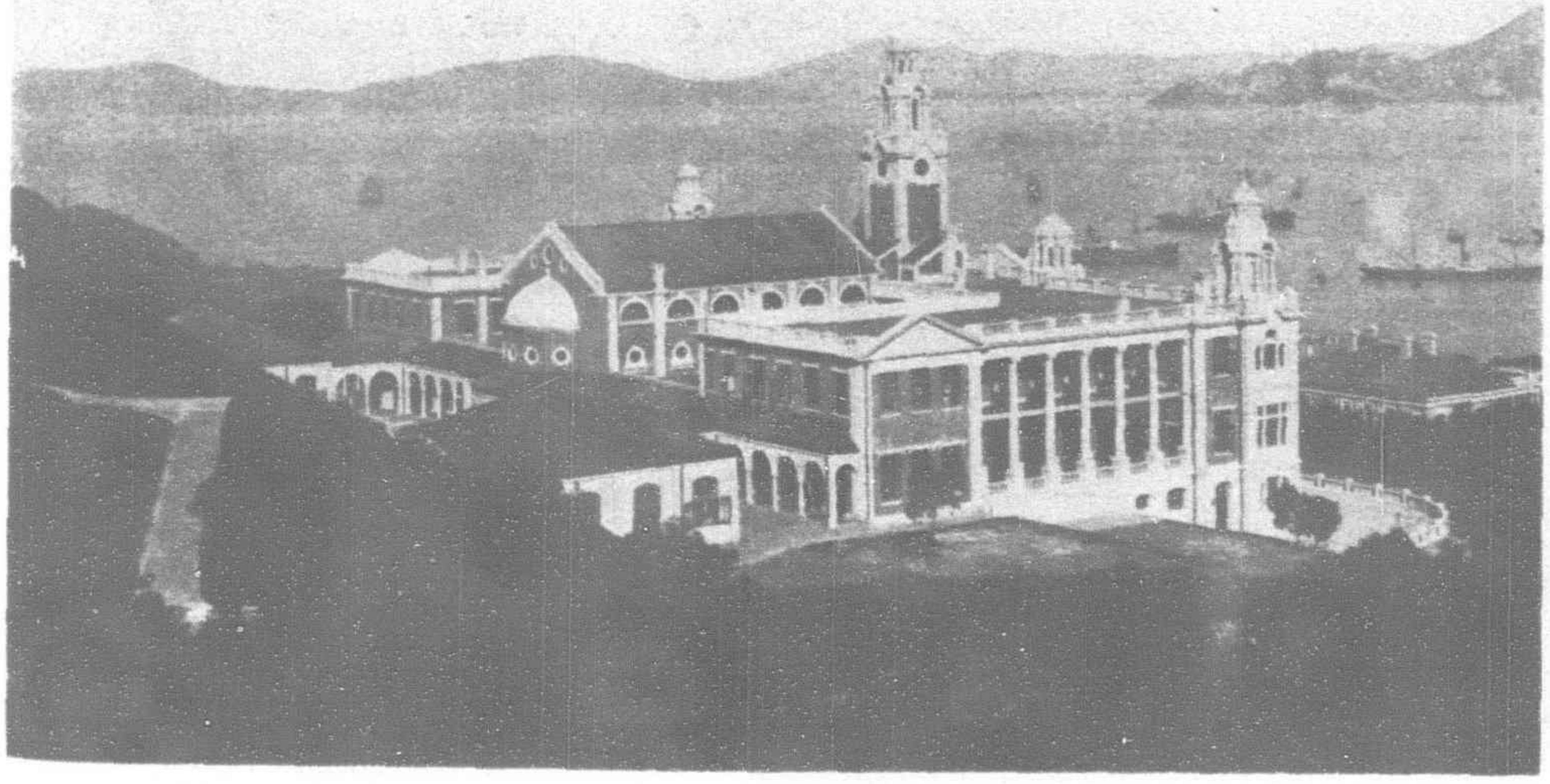
(1) A Crossley gas engine directly coupled to an 8 kw. generator.
(2) A 35 b.h.p. Campbell gas engine directly coupled to a 20 kw. generator.
(3) 50 b.h.p. National heavy oil engine directly coupled to a 30 kw. generator.
(4) 38 b.h.p. Gardner 4-cylinder, vertical, oil engine directly coupled to a 24.5 kw. generator.
(5) A Gardener kerosene engine directly coupled to a 7 kw. generator.
(6) A 3.5—4.5 b.h.p. Turner kerosene oil engine.
(7) Two petrol engines.
(8) Two steam engines.
(9) A Curtis steam turbine coupled to a 35 kw. generator.
(10) A Ruston single-cylinder, horizontal, heavy oil engine.

There are three boilers in the boiler room, viz:—

(1) A Babcock and Wilcox water tube boiler.
(2) A White marine boiler.
(3) A vertical cross-tube boiler.

In addition to the above list, there are also four air compressors, two refrigerators, one producer plant, two forced draught fans, and three pumps for circulating cooling water and condensing water, and for feeding furnaces and boilers. The laboratory has now a total output capacity of 124.5 kw. at 110-volts D.C. The lighting for the whole laboratory will be supplied by our own generators, the electric cables being buried underground.

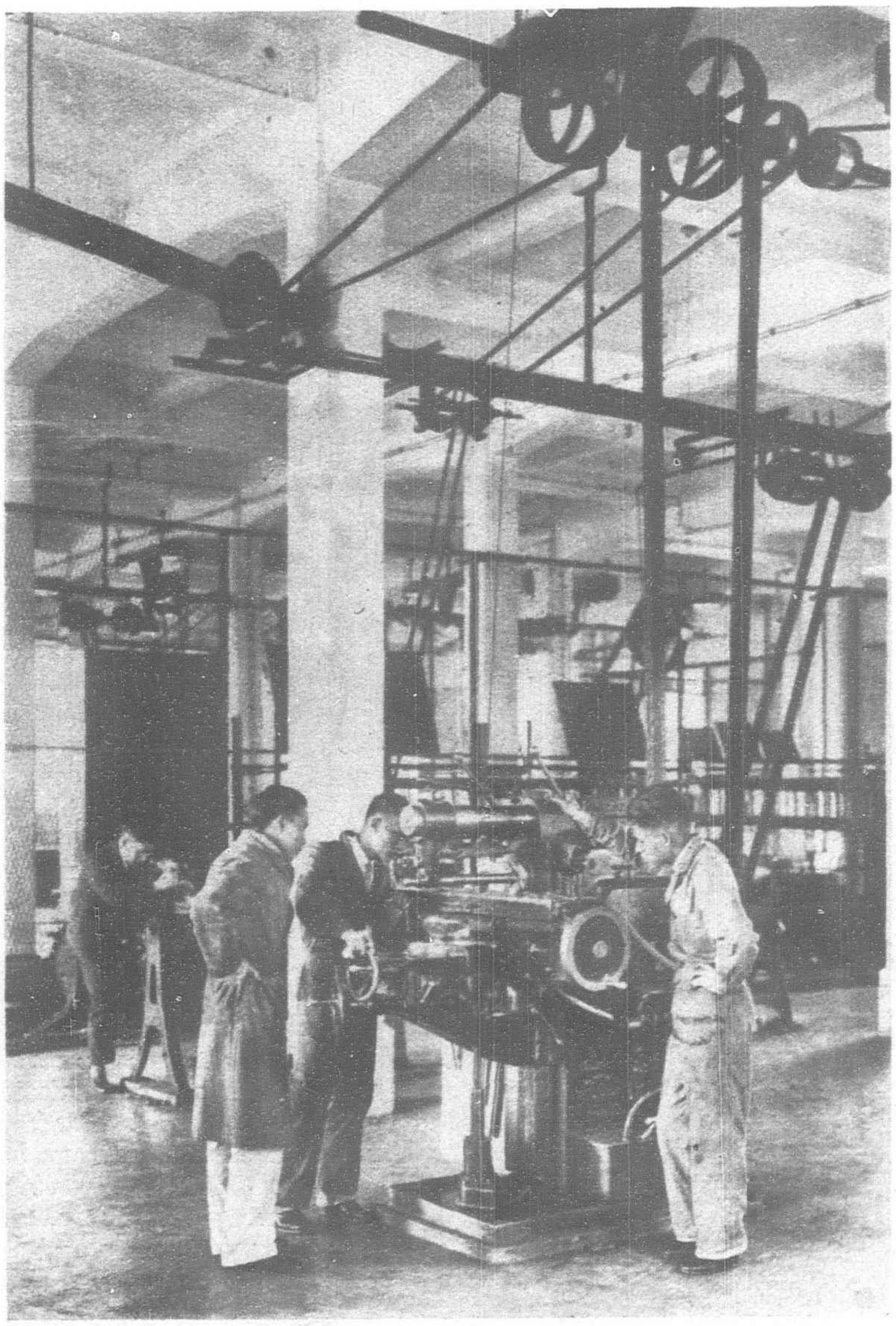
When completed, all the cooling water pipes for the cylinder jackets will be supported near to the floor, while the air, gas and exhaust pipes are enclosed in channels. The condensing water, after passing through the condensers, will be allowed to run back to the tank outside, and the jacket cooling water will be passed through a cooler and delivered back to the water tank by means of a pump. A new condenser has been added to the Curtis turbine to condense the steam used so that the consumption of steam can be accurately determined.



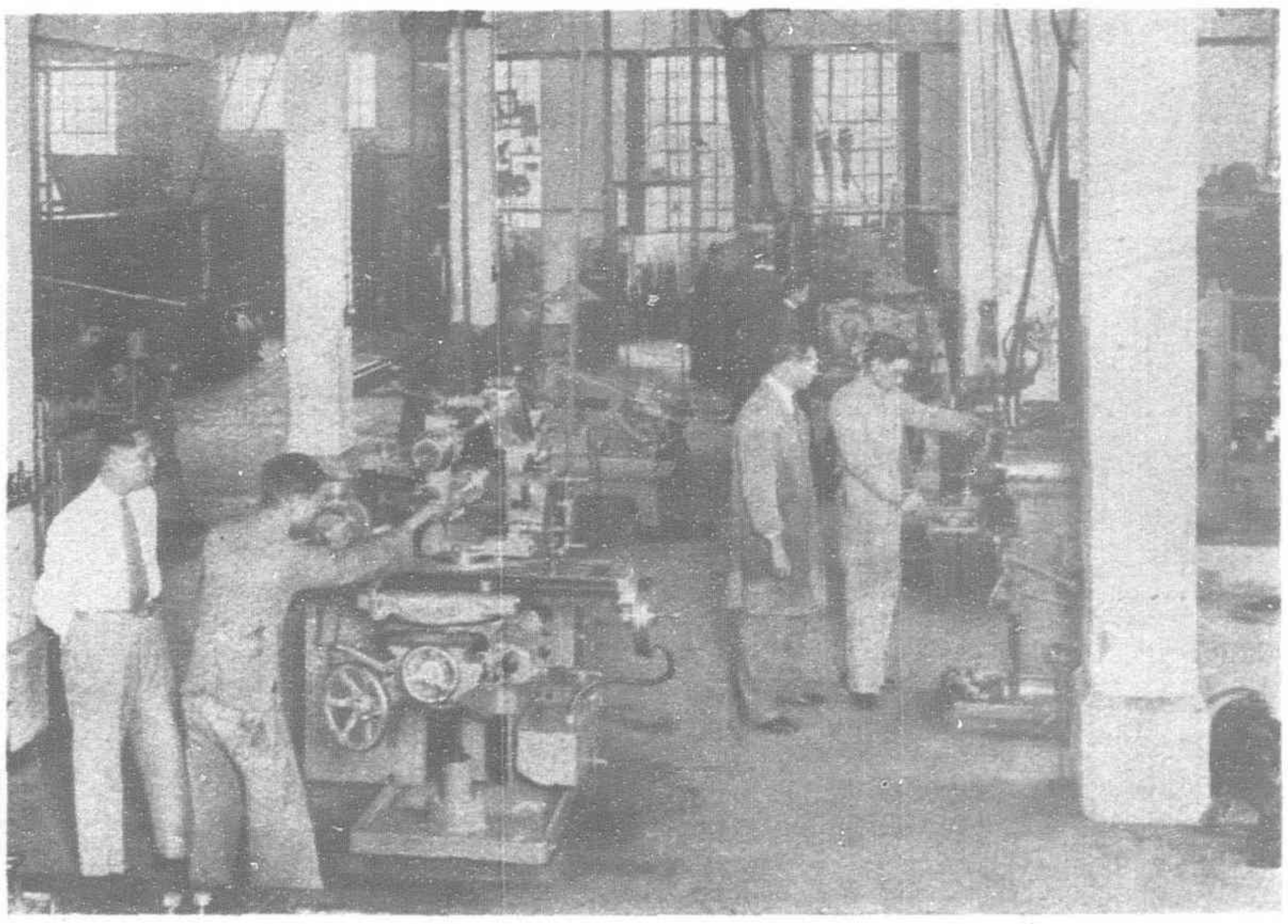
Main Building of the University of Hongkong, opened March 15, 1912

During removal of the engines, a non-academic critic made the remark that he thought the power station of the University should have only modern and up-to-date engines. He was apparently disappointed to find some of the engines had been installed more than ten years ago. It may be concluded that he thought these old engines would not be efficient for purposes of demonstration. In answer to this not uncommon notion, it can be said that although an up-to-date engine may be perfect in regard to speed regulation, flexibility, etc., it may not be so fitted and arranged that the working parts are visible, and accessible to students. Though obsolete in design, an old engine may show some rudimentary principle better than, and serve as a good contrast to, modern machines. The best place for every type of new engines to be shown is at an exhibition or the showroom of an engineering firm. The practical engineer who wishes to keep pace with the development in engineering, must read the well-known engineering publications and periodicals from time to time, as even text books cannot keep pace with the ever changing progress in any branch of engineering. But the engineering student in order to learn first principles must also know how the machines have evolved. It can be said that the spacious accommodation and the varied equipment consisting of the different types of heat engines, etc., will provide the students of the Hongkong University splendid opportunities for practical experience in power generation, which is the basis of modern industry.

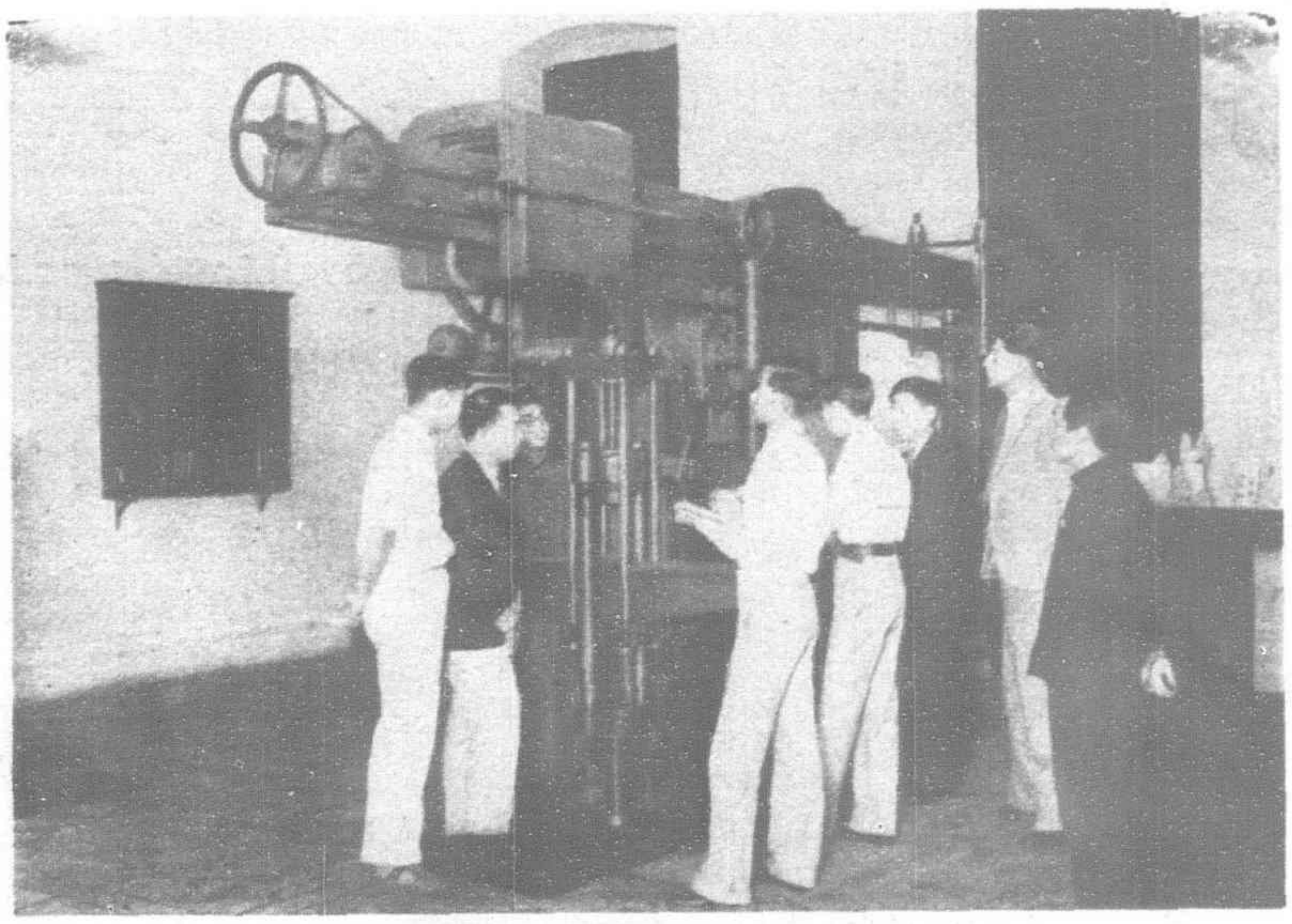
The Ho-Tung Engineering Workshop, opened in 1924



Engineering Students using Milling Machine in Workshop



Engineering Students in the Ho-Tung Workshop



Testing Steel in the Materials Laboratory

Japan-Manchuria Shipping

In view of considerable increase of travellers between Japan and Manchuria, the Railway Ministry has decided to construct a ferry-steamer of 6,500 tons with the accommodation for 760 persons this year to be put in commission between Shimonoseki and Fuzan.

On the other hand, the O.S.K. and the N.Y.K. are planning to each build a modern type steamer within this year to place them on the Kobe-Dairen line in addition to the vessels now in commission.

The passengers of the ferry-steamers between Shimonoseki and Fuzan during the three months from October to December last year numbered 415,467, showing a remarkable increase of threefold as compared with an average for the corresponding period of ordinary year.

Manchurian Oil Fields Boom*

Capacity of the Shale Plant at Fushun is Being Doubled

STIMULATED by the Manchurian oil monopoly under which the State's first needs will be supplied from native sources, the " coal city " of Fushun has become a boom oil town. Already an important factor in oil supplies for Manchuria, Fushun by next year will supply a third of the nation's gasoline needs, and eventually expects to absorb the whole trade.

Shock brigades of engineers, chemists and contractors are speeding the vast enlargements to existing facilities which will bring the shale oil plant into new levels of production by the Spring of 1935. Five million dollars is being expended on the " oil works " where the brown rocks formerly regarded as waste are converted into oil. Alongside the oil plant a big cement works is going up. This will take care of the by-product of the shale, and, under the protective tariff for cement, is expected to enjoy immediate prosperity.

While wealth in enormous quantities is being realized from the production of eight million tons of coal a year, from the oil plant and the cement and other works, the city is grappling with its share of the big canal development, to link Fushun with Yingkou and thus to develop a " seaport " alongside Mukden, in the heart of South Manchuria.

Engineers assert that modern science has brought Manchuria near to the point where she will be wholly independent of foreign oil supplies, and this without the use of coal extracts, an industry now commanding great interest in England.

New buildings are nearing completion alongside the original shale oil factory. New machinery is on the ground, and workmen are rushing it into position. The most modern ideas in extraction are being employed, making the production of oil more economical than ever. Vast sources of wealth are being tapped at a rapidly expanding rate, and the city of Fushun is in a high state of prosperous excitement.

" The greatest mining city of the Far East " is making much of its unique position which excludes the exploitation of the district resources by other than semi-official and national enterprise.

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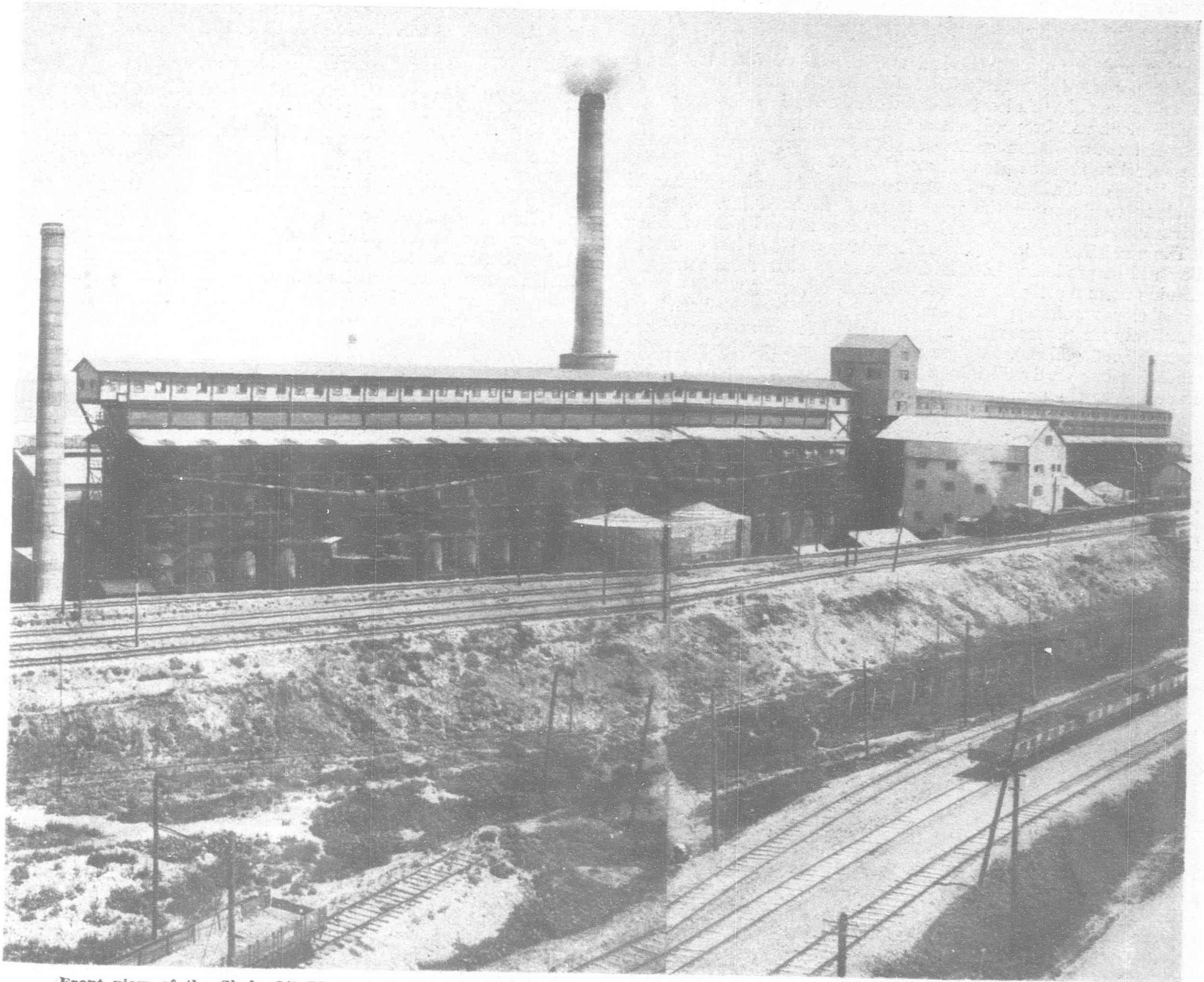
* *The Manchurian Month*



Front view of the Shale Oil Plant at Fushun the capacity of which will be doubled when extensions under way are completed

The present oil resource of Manchuria, a subject of world-wide concern, consists entirely of 5,400,000,000 tons of shale-oil deposit at Fushun, a mineral much harder but less dark than coal, and yielding for the most part four to ten per cent of oil. An array of giant electric and steam shovels are stripping daily over 6,000 tons of the shale, which is conveyed by electric trains to a Y.13,500,000 oil distillation plant nearby, whose enlarged annual output from next year will amount to 145,000 tons of crude oil and about 37,000 tons of sulphate of ammonia. The crude oil is rendered in the Fushun plant into fuel oil, coke, paraffin and gasolene. The annual output of gasolene from next fiscal year may exceed 3,000,000 gallons, according to Mr. Yoshio Yamazaki, superintendent of the oil distillation plant.

Production Doubled

The shale of Fushun, consigned to a waste heap for 15 years after the open-cut system of coal mining was adopted there, is confidently expected to prove the mainstay of Manchuria's expanding petroleum industry. The Fushun shale found between the coal seam and surface ground there, is a layer of 120 to 450 feet.

The Fushun distillation plant, established in 1929, will double its production capacity of crude oil by April next year. The S.M.R. is spending Y.5,000,000 to enlarge the factory, which originally cost over Y.8,500,000. Also, a cement manufacturing plant with an annual output of 200,000 tons is now being built near the oil distillation works. The cement will be made from oil-extracted residue of the shale. Thus, from the once neglected shale will be produced fuel oil, coke, paraffin, sulphate of ammonia, gasolene and cement, all indispensable articles of modern civilized life.

In developing the great shale-oil industry, the S.M.R. Company, owning and operating shale-bed and the oil distillation plant is aiding powerfully to materialize the Manchuokuo Government's new oil monopoly. At least one-third of Manchuria's oil and gasolene requirement will be produced at Fushun from the abundant raw material there. Much greater expansion is programmed for the future, when positive need arises.

" Our oil distillation plant never produced any kerosene and is unlikely to do so in the near future," declared Mr. Koreshige Miyazawa, chief of the General Affairs Office of the Fushun Colliery. " The new Manchuria Petroleum Company at Kanseishi on Dairen Bay will be producing both kerosene and gasolene from next year, refining them mostly from imported crude oil.

" Our gasolene production up to this year has been comparatively small, amounting to some 1,200 kiloliters a year (slightly over 300,000 gallons). It was produced as a mere by-product in rendering our crude oil into a fuel oil of 950 degree flash point, according to the naval specification.

Navy Big Customer

" It should be understood that heretofore all fuel oil and paraffin from our distillation plant were shipped to Tokuyama, where are located a great oil storage plant of the Imperial Navy, and the Japan Paraffin Refining Works. When the distillation plant was completed here five years ago, its main product of fuel oil was meant for naval use ; and nobody then thought of distributing our petroleum products over whole Manchuria.

" But with the launching of the Manchuokuo Oil Monopoly the primal function of the Fushun shale oil plant has altered. The S.M.R. directorate have wisely and promptly resolved to double the capacity of the distillation plant here by appropriating Y.5,000,000 for the purpose. And although so much money was needed for the expansion program only about 50 additional men will be engaged to attend to the new and expensive machinery. That demonstrates the complicated operations of the oil plant are largely performed by machines.

" The doubling of the distillation plant means the daily utilization of some 8,000 tons of shale and daily production of some 420 tons of crude oil there. The total annual output of 145,000 tons of crude oil will be constant from the enlarged plant, being double the original capacity of the plant. It is just now in process of being enlarged, and consequently producing more than the original capacity.

Chemists Active

" But the respective output of gasolene, paraffin, coke and fuel oil may be less or more than double our previous annual productions of those products. That is due to a possible change in the formulæ and methods of refining our crude oil from next April. This important matter is still under study by our chemists, and subject to sanction by the Dairen Main Office. So I cannot give out the tentative details for publication at present, but I am sure our gasolene output will be increased several times from next year.

" The following semi-annual production figures of our oil plant, from April 1 to the end of September this year, indicate the new tendency of producing lesser proportion of fuel oil and relatively larger amount of gasolene from basic crude oil : 17,150 tons of fuel oil, 680 kiloliters (about 180,000 gallons) of gasolene, 1,395 tons of coke ; 5,520 tons of paraffin and 6,120 tons of sulphate of ammonia. Besides, our Mond gas plant also produced during the past fiscal year 5,600 tons of ammonia as a by-product.

Explosive Products

" So we are producing this ammonia, so essential as a rich fertilizer and as a base for explosive compounds, from two sources here. Their combined annual output here from next year will exceed 40,000 tons. In the last fiscal year we produced 54,260 tons of fuel oil and 17,800 tons of paraffin, all shipped to Tokuyama."

The financial returns of the distillation plant are contained in a mimeographed pamphlet presented the writer at Fushun. Summarized, it states that total income for the first full year of the plant's operation, starting in April, 1930, was Y.2,615,401 and its aggregate expenditure Y.2,582,832.

The profit realized therefore amounted to about Y.32,000. But in the third year (1932) its gross profit totaled Y.538,027, or about 15 times the profit of the starting year. It is now one of the S.M.R. Company's most profitable enterprises.

" The probable gasolene requirement for whole Manchuria for next year we estimate at 40,000 kiloliter and this distillation plant will be able to supply about 12,000 kiloliters, or nearly one-third the total need " stated Mr. Yamasaki, the superintendent of the shale oil distillation plant.

Steps in Development

" Experiment in extracting oil from the local shale was started nine years ago by Mr. Raiji Ohashi, who is now in charge of oil refining section of this plant. The building of this oil-making establishment started formally in January 1, 1928, and its first mass production commenced on May 1, 1930. The next big stage in its development will be on April 1, next year, when the enlarged capacity production gets under full swing."

Mr. Yamasaki then showed samples of Fushun's petroleum products, with their chemical contents exactly labeled. He stated : " This oil distillation plant is only a part of the manifold activities of the Fushun Colliery, now employing nearly 40,000 Manchus and 3,500 Japanese. But the rôle of the oil plant has been enhanced greatly by the enactment of the Manchuria Oil Monopoly Law."

A tour of the extensive shale-oil deposit, covering several square miles, in the keen winds of a winter afternoons howed seven electric and steam shovels in action on a portion of the shale field. The big shovels, at every bite scoops up from two to three tons of shale, which was previously loosened by dynamite blasting. The newest type of electric shovels cost Y.300,000 each, made at a Mitsubishi iron works in Japan. " A similar shovel, if imported from America costs Y.600,000 " reminded Mr. Yamasaki. All new shovels are electrically operated ; older ones are steam-powered.

Following one of electric trains from the shale-bed to the distillation plant, where lofty chimneys are belching smoke, odors of oil and fumes of gas, and grinding roars fill the atmosphere, one views a colossal and unique enterprise. It is the only shale-oil distillation plant in the Orient, and is the potent agent freeing Manchuria from foreign oil domination.

Maw of Grinders

The shale from the electric driven freight car is first dumped mechanically into a giant " hopper," sent up an incline by an electric conveyer in an unending stream, into a primary grinder, where shale lumps (of several inches length) are ground into coarse grain. A secondary grinder pulverizes the grains. The material is conveyed to several elevated vats and subjected to a heated gas treatment, when a large part of the oil centent is extracted. A

(Continued on page 30)

Engineering Accomplishments of the China International Famine Relief Commission

(The following article summarizes important engineering undertakings of the China International Famine Relief Commission through the years from 1921 to 1932. It is supplementary to and follows the article published in the December number of "The Far Eastern Review" describing engineering accomplishments of the China International Famine Relief Commission in the years 1932-33. Both of these articles are taken from the report of Major O. J. Todd, Chief Engineer, China International Famine Relief Commission).

* * *

The Engineering Department of the China International Famine Relief Commission was organized late in 1923 for the purpose of uniting the engineering work that had formerly been done by provincial Committees. Reports on this work starting with the famine of 1921 have been published in three previous issues of "Engineering Accomplishments" and in the annual reports of the Commission.

A short review will here be given of work done up to 1932 and previously reported in similar papers.

Yellow River Reversion Near Li Tsin

Not long after its formation the Commission played an important rôle co-operating in a large flood relief project near Li Tsin, Shantung, where the Yellow River had left its banks in the summer of 1921 desolating a vast area in the north-eastern corner of the province. Here the Commission contributed $360,000.00 out of the $1,500,000.00 required to complete the undertaking. Shantung Province raised over $1,000,000.00 for this project and engaged foreign engineering skill to plan and execute this reversion work. Two hundred square miles of farm lands in three hsien (counties) were reclaimed, permitting 250,000 people to return to their homes. Upon the successful completion of this most notable piece of river training in recent years, the Chief Engineer who had laid out and handled the work was chosen to head the Commission's new Engineering Department.

Shantung Needed More Assistance

In 1922 two motor roads were also constructed, one from Tsining to Tsaochow, a distance of 80 miles, at a cost of $150,000.00 paid from funds donated by America, and another 45 miles long from Chowtsun to the Yellow River, costing $60,000.00 These two roads have been in almost constant use for the last ten years with bus service over them and to points beyond.

While these were being built, repairs to the inner dikes of the Yellow River went forward from a point near its mouth to the western border of the province, in ten hsien (counties), at a total cost of $200,000.00 At the same time, extra culverts and other repairs were put into the Red Cross Roads built north of the Yellow River the previous year. These improvements amounted to $90,000.00. To the north-west of Tsinan and north of the Yellow River, another $30,000.00 was spent that year on cleaning main drainage canals.

Due to a recurrence of drought in this province in 1928 a program of well digging was inaugurated to aid irrigation. The Commission thus helped northern Shantung in 1928-29 by loaning money for putting down 1,125 wells for farmers. Also in early 1929 the Commission did flood protection work in this province along the Wei Ho and Grand Canal at a cost of $32,000.00 in cash, plus materials donated by local authorities.

Road improvements to extend motor service in four counties of west and south Shantung were carried out as famine relief projects in 1929 at a cost of $45,000.00.

Honan Builds Roads, Dikes and Canals

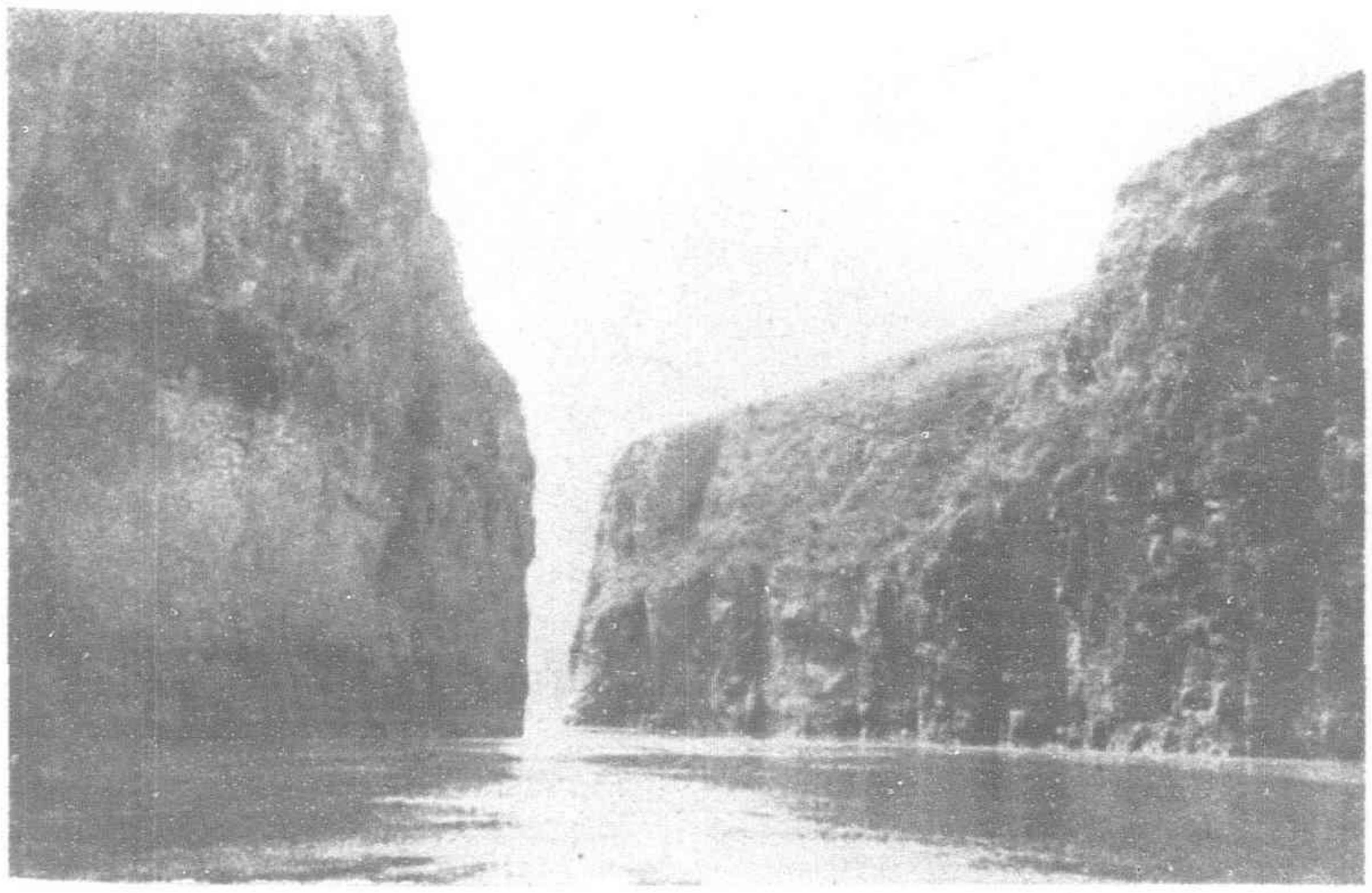
During the first two years of the Commission's existence the Honan Committee improved or built 700 miles of new highways so that motor-cars might be generally used over the eastern part of the province. This led to further extension of the highway system by the local governments so that to-day most of the principal cities of eastern Honan are connected by auto service. This same Committee built six miles of new Yellow River dike at a cost of $90,000.00, dug 13 miles of irrigation canal, cleaned the upper Hwei Chi River for 28 miles, etc. The sum of $500,000.00 was thus spent in engineering improvements in that province. Since then road improvements have gone forward supported by various political leaders in Honan.

The 1928 drought caused bad famine conditions in south-west Honan in 1928-29. Work of surveys and construction of a motor road from Hsuchow to Nanyang was begun in early 1929 on this 105 mile route, but civil war stopped the work. The following year the Commission's Chief Engineer made estimates for improving the motor road from Kaifeng to Hsuchow, a distance of 80 miles, and a portion of this work was done through our Honan Committee.

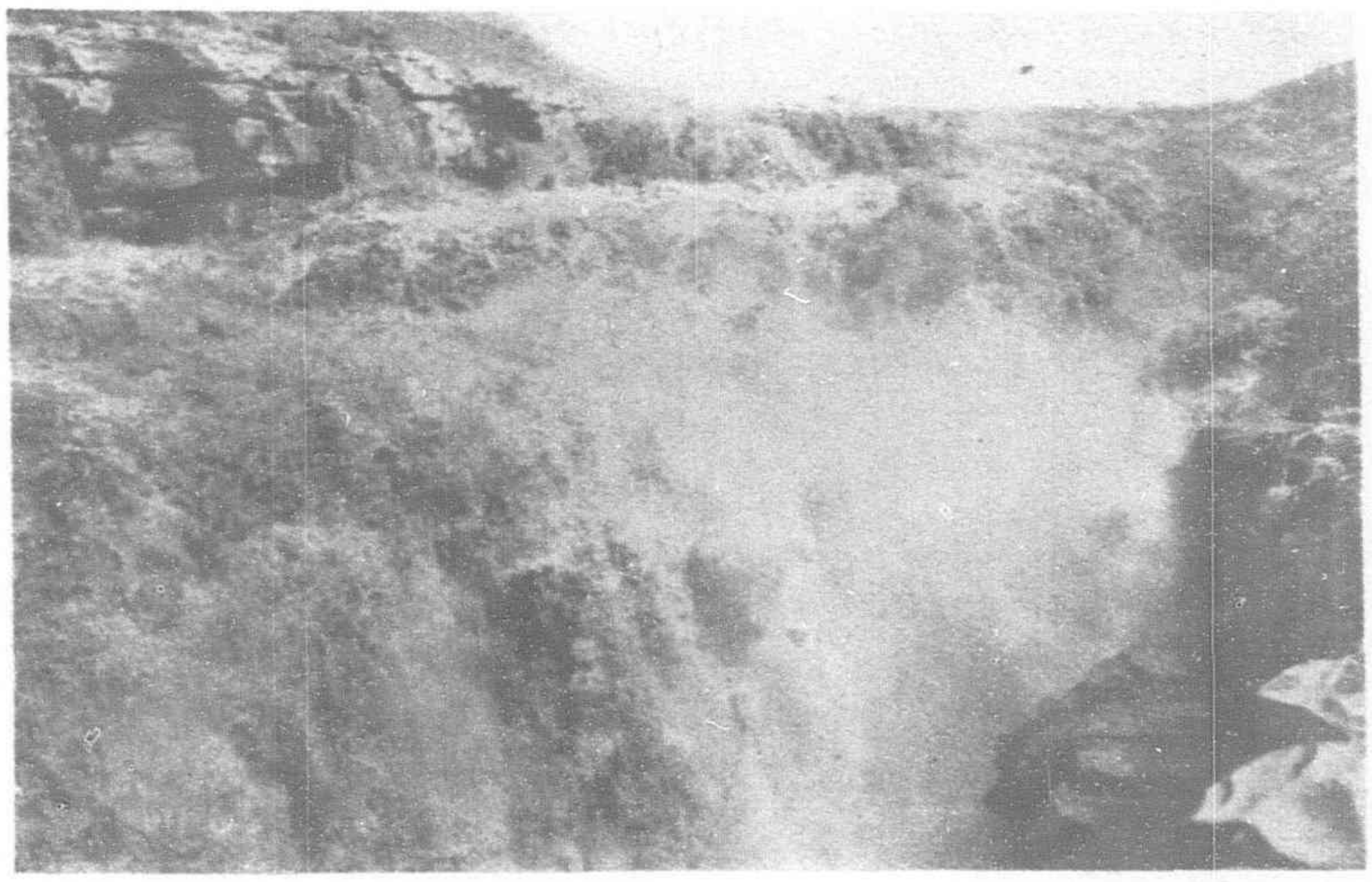
The Wei Pei Irrigation Project

Surveys of the Wei Pei Project were carried out by the Shensi Committee of the China International Famine Relief Commission during 1923 and 1924. The Chief Engineer of the Commission visited this region and studied the project in 1924, recommending at that time the construction of this utility as soon as funds could be obtained.

The severe famine conditions of 1929-30 in central Shensi revived interest in this utility and the sum of $500,000.00 was



The Yellow River Gorges north of Yumenk'ou, Shansi

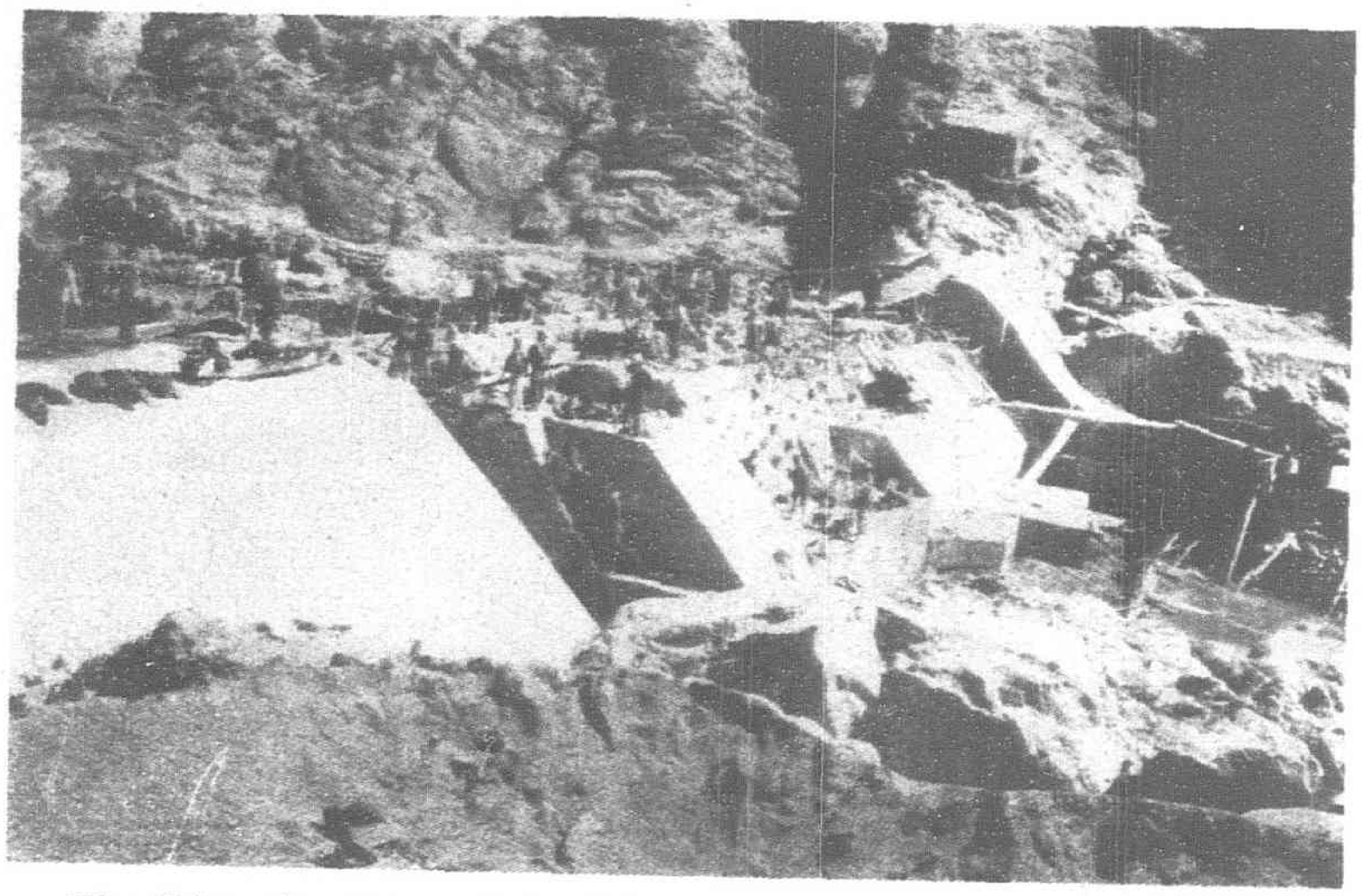


The Yellow River tumbling into a Slot 65 feet wide and dropping 70 feet at Hu-k'ou, Shansi, 100,000 horse-power

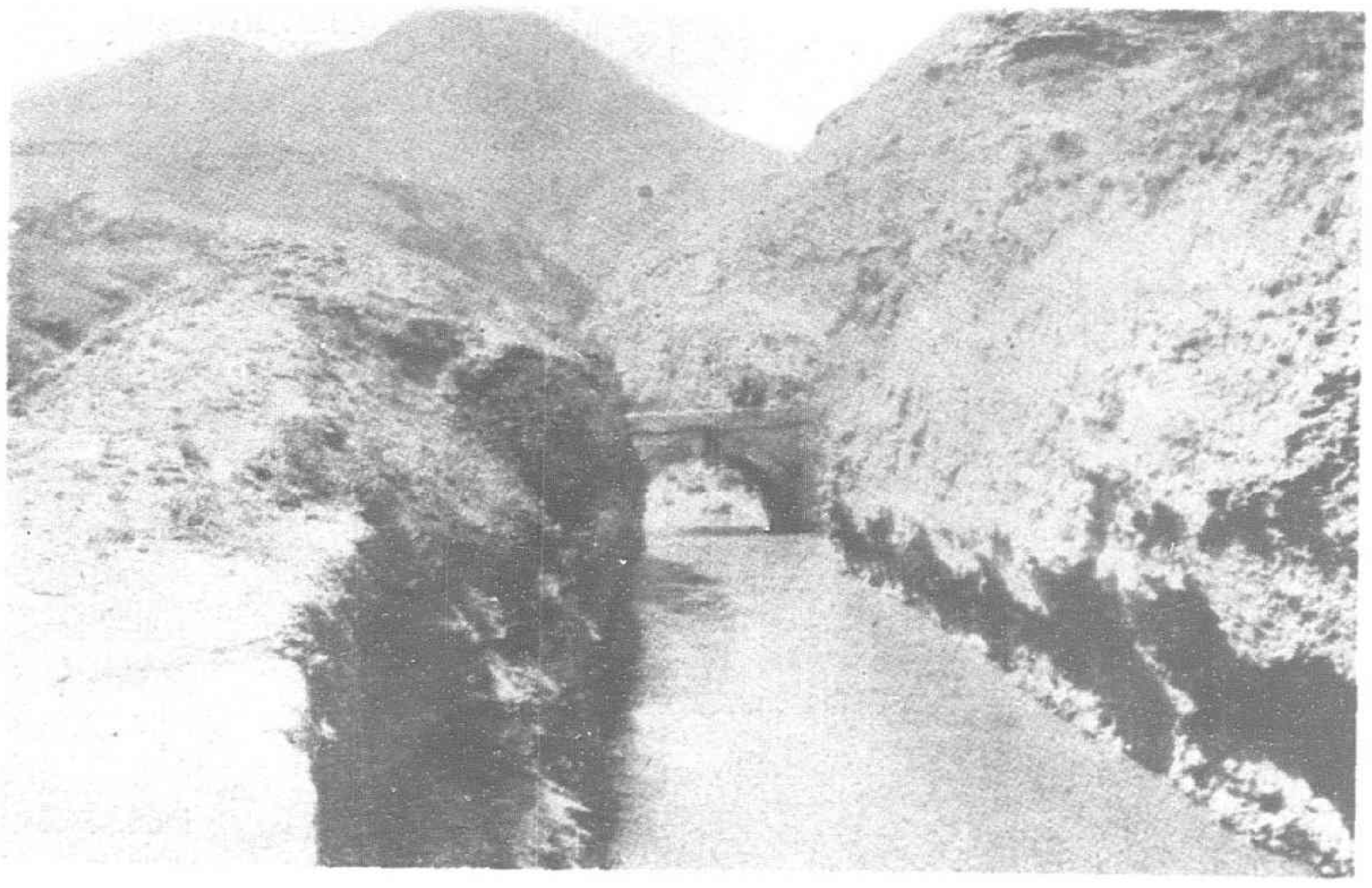
appropriated by the Commission to carry forward the work, which was estimated at $1,000,000.00. Our work there began in December 1930 and was not completed by the close of 1931. Other gifts were added and the work progressed rapidly through 1931 on the dam, tunnel, rock cut channel, etc., connected with the upper part of this project which the Commission undertook to do. It was a fine piece of famine preventive work to bring water to irrigate 90,000 acres of Wei Pei land. Local authorities gave good co-operation so the completion of this utility during 1932 was assured.

Hupeh Dike System Improved

In the early days of the Commission and through 1927 the Hupeh Committee interested itself in dike construction particularly along the Han and Yangtze Rivers as famine prevention work of great urgency. Altogether over twenty flood prevention projects were thus undertaken and completed by this Committee at a cost of something over $1,600,000.00, approximately half of this being borne by the China International Famine Relief Commission. Two of the most notable pieces of work in this connection were the Shihshow dike at Temple Hill and improvements to the Chang Kung dike back of Hankow (Increased crop values upwards of $2,000,000.00 have annually been obtained in the lands back of the Shihshow dike since 1925). It is to be noted that neither of these dikes failed during the unprecedented floods of recent years.



The Diversion Dam of the Wei Pei Project under Construction

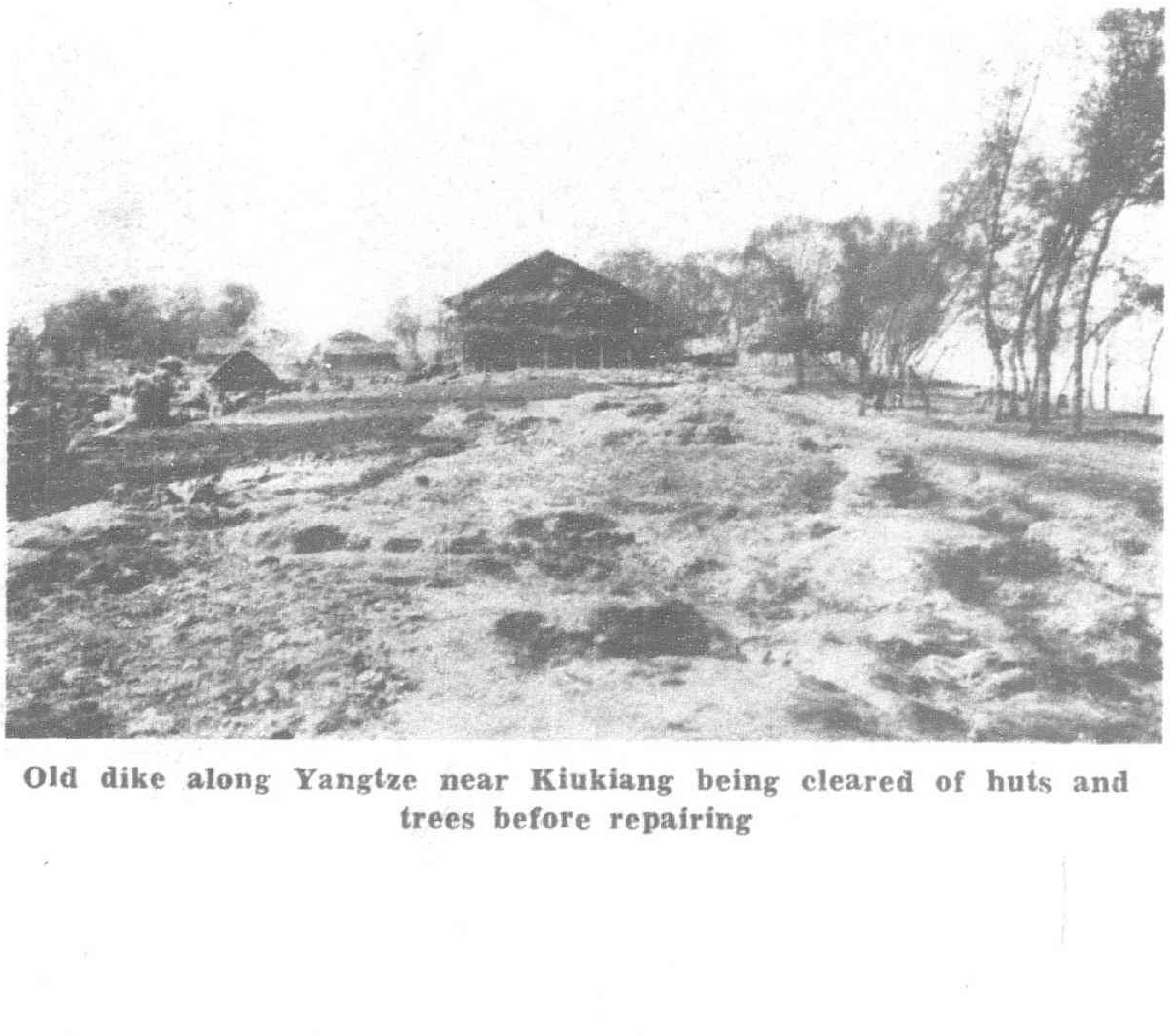


A Bridge in Rock Section of Main Canal on Wei Pei Project

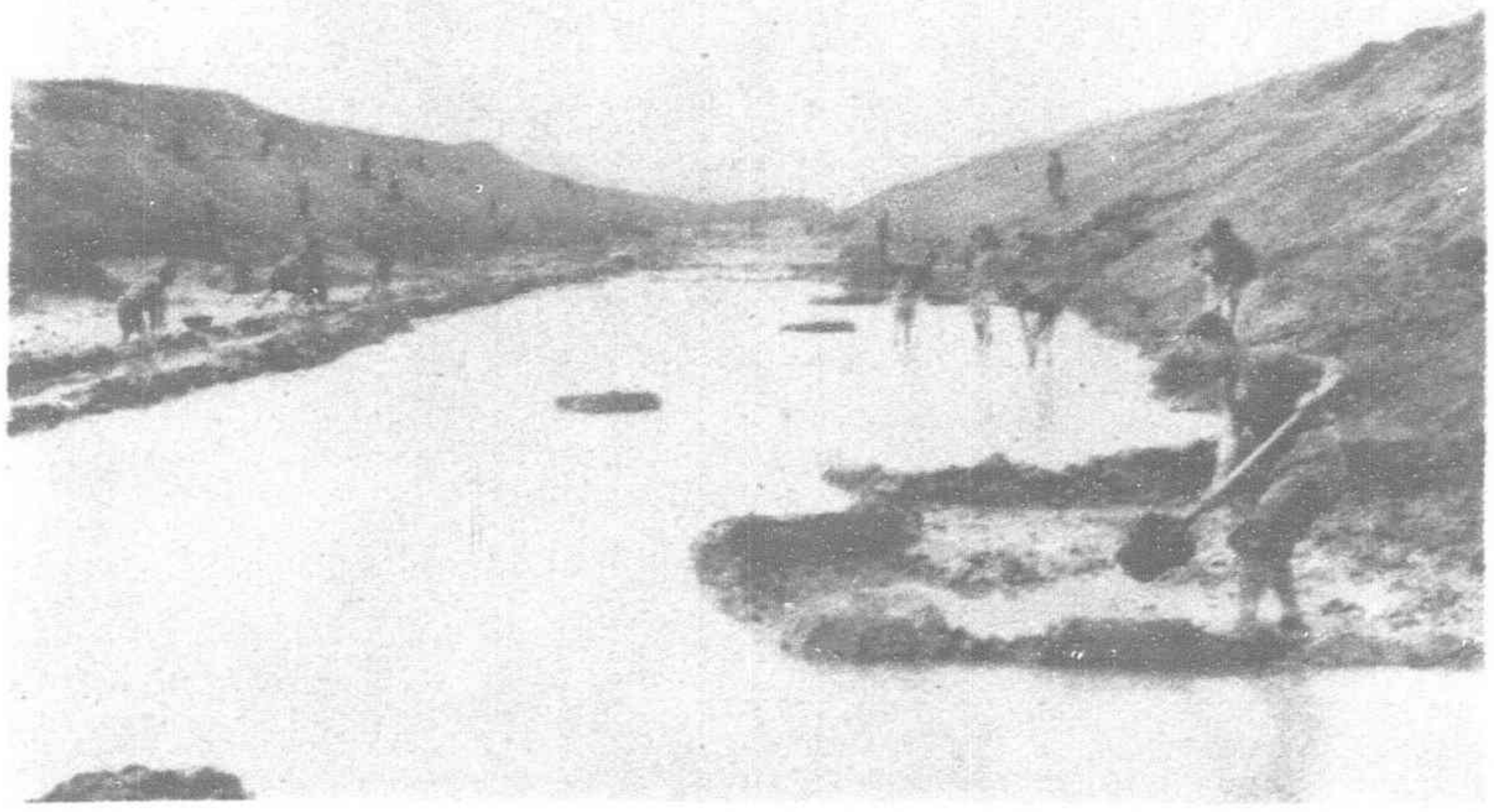
Freight hauling by ricsha along Motor Road south of Taiyuan, Shansi

Travelling by Cart from Chinchow toward Liaochow, Shansi

Good dike construction near Tuan Yao, ten miles east of Kiukiang, North Bank of Yangtze



Old dike along Yangtze near Kiukiang being cleared of huts and trees before repairing



Completing excavation of main Saratsi canal Intake

Check-gate No. 2 at No. 9 Lateral Main Canal of Saratsi Project

The Good Road Movement in Shansi

Following up the famine of 1921 our Shansi Committee put $190,000.00 into the construction of motor roads in that province. This, with the work of the American Red Cross in 1921, so encouraged road building that now motor buses are common between nearly all the large cities of Shansi. That province now has many hundreds of miles of good motor roads maintained by the provincial government.

In 1929-30 the Commission reconditioned the Houma-Hotsin motor road, 45 miles long, and built eight miles of new motor road from Hotsin to Yumenkow on the Yellow River at an expenditure of $22,000.00.

Hunan also Builds Roads

With a grant of $500,000.00 from the American Advisory Committee our Hunan Committee undertook the construction of the Siangtan-Paoking motor road 110 miles long. These funds were sufficient for about half of this road. The remainder of the work was later done by the Province so that auto service is regular in that region to-day. With this beginning, and a 30 mile road connecting Siantan with Changsha, the province has entered upon a rather ambitious motor road program.

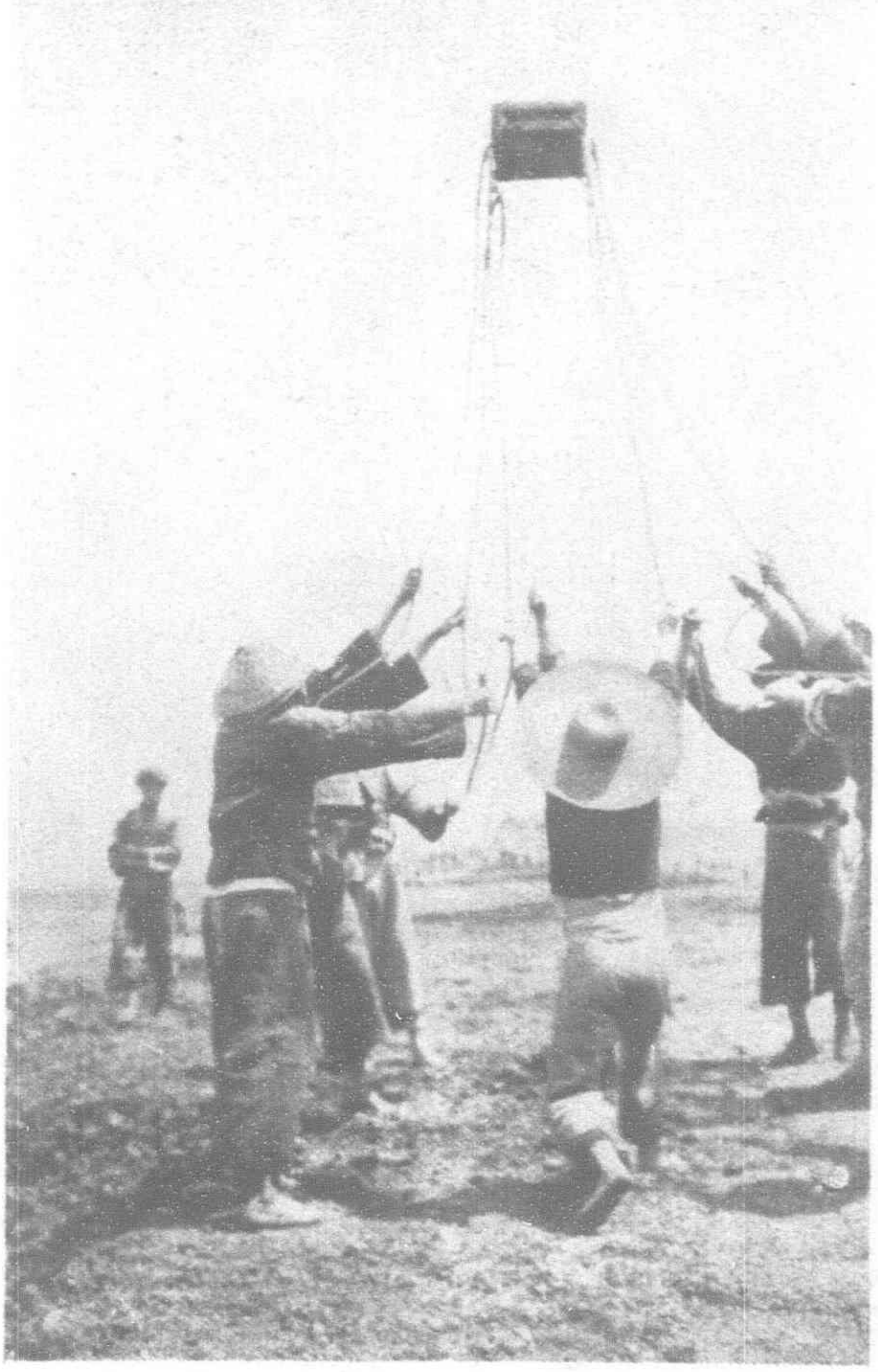
The Kan River and Roads in Kiangsi

After the heavy floods along the Kan River in the summer of 1924 our Kiangsi Committee carried out a dike reconstruction program costing $200,000.00 in the Kan River delta. This work protected rice crops worth several million dollars annually.

Famine prevention in Kiangsi in 1929-30 took the form of motor road building. In connection with our Kiangsi Committee of the C.I.F.R.C. our engineers put a gravel surface on ten miles of new motor road immediately south of Nanchang on the Nanchang-Linton Motor Road at a cost of $75,000.00. The road had been constructed by the Kiangsi Provincial Road Bureau, but the clay soil was so sticky that in wet weather traffic had to be suspended until this metalling made it an all-year road. Co-operation with the local authorities was good.

Kweichow's First Motor Roads

The Commission co-operated with the Government of Kweichow in 1927 in the work of laying out and constructing 600 miles of well graded motor roads through that mountainous province. At the peak of the work 200,000 men were engaged on the construction. In this work soldiers, school boys and girls, and farmers were enlisted. It was one of the outstanding movements of recent years in road construction in China. The Commission's Chief Engineer visited Kweichow both in 1926 and in 1927 to assist in laying out and organizing this work.



An 8-man stone flapper on dike building in Kiangsi

Yunnan Road Extensions

Our Yunnan Committee began road construction in this province in the spring of 1927 building 15 miles of standard motor road that season to the east of Yunnanfu. The Chief Engineer visited this province both in 1926 and 1927 when in that part of China organizing work in Kweichow.

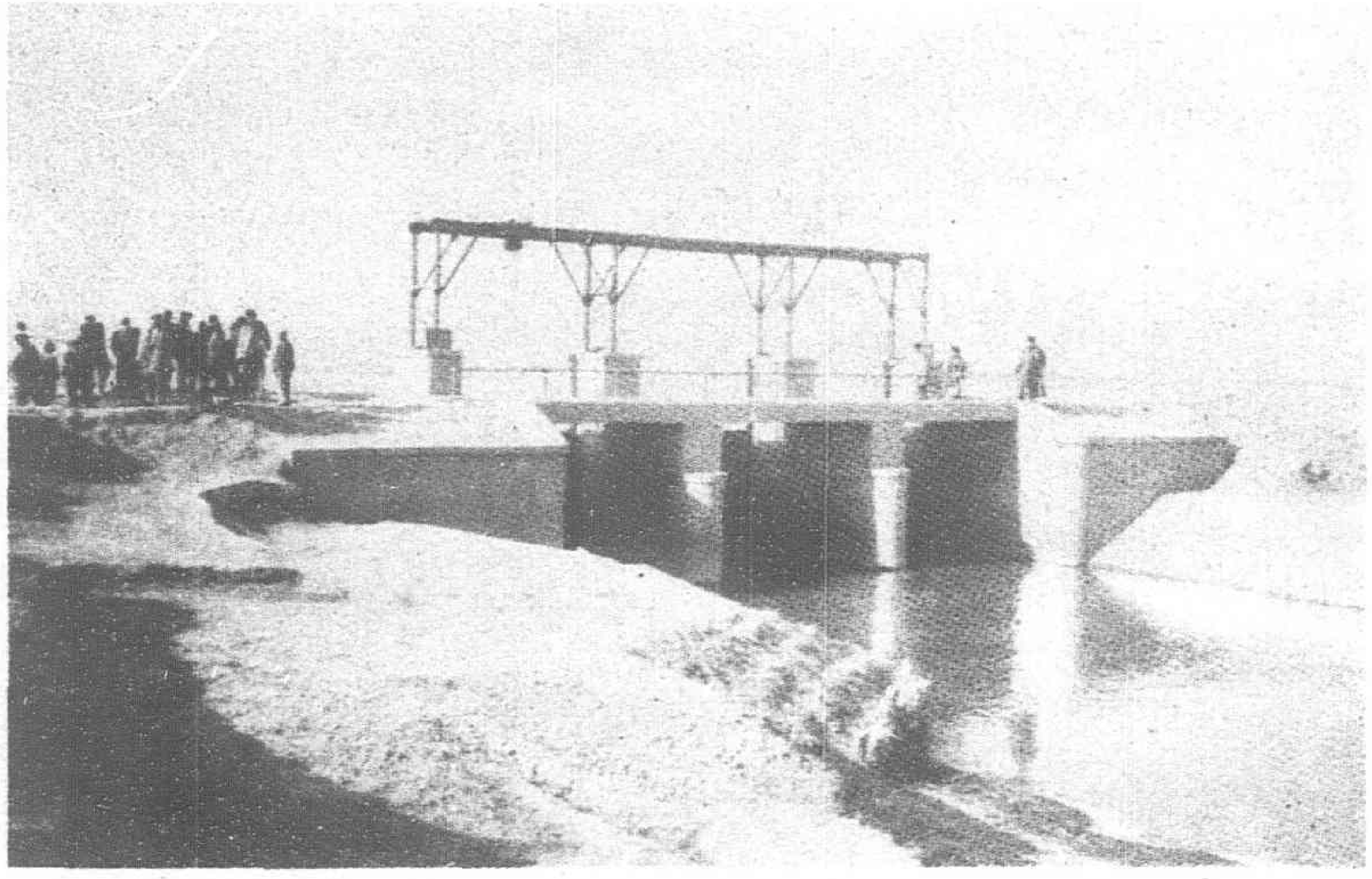
In extending and improving the work of road building near Yunnanfu done by our Commission in 1927 our Yunnan Committee expended $34,000.00 in 1929. Part of this went for bridge repairs and part for metalling of the clay road.

Activities in Hopei Province

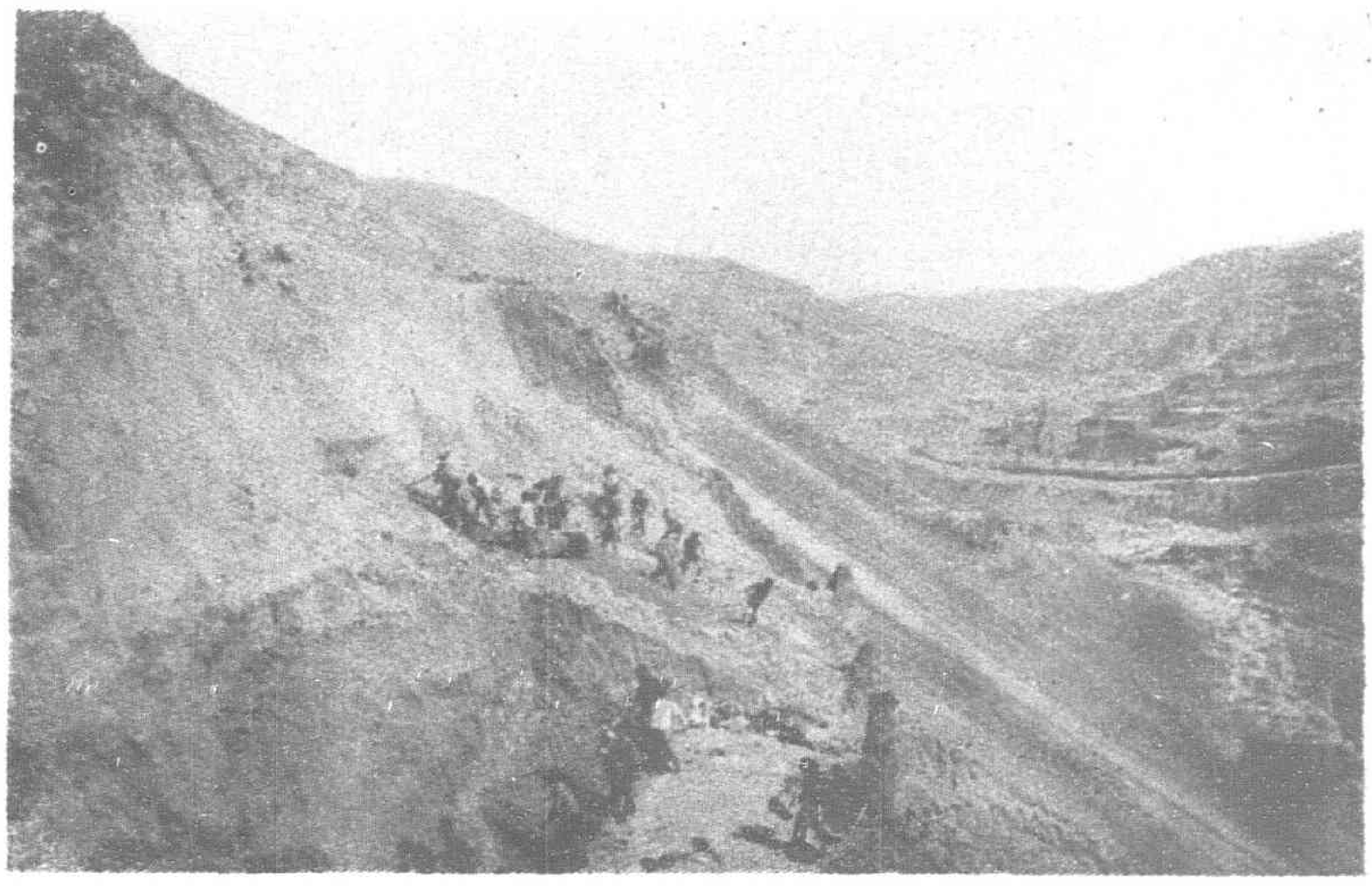
In the spring of 1928 the Shih Lu Irrigation Project was dedicated and farmers along the canals were furnished water for their fields. This project has cost the Commission to date nearly $130,000.00, all of which is eventually to be repaid by the water users. The system serves 12,000 acres of land ten miles west of Peiping and takes water from the Yung Ting Ho.

The heavy rains of July, 1924, caused widespread damage to low lying lands in the Paotingfu-Tientsin area of Hopei. An extensive diking program was therefore laid out by the Hopei Committee and in 1925 and 1926 approximately $400,000.00 was spent in rebuilding many miles of dikes, particularly in the region near West Lake, 25 miles east of Paotingfu, when the work was carried out in the spring and summer of 1925. On the whole this work was highly successful in the West Lake region, where additional crops valued at no less than $5,000,000.00 were harvested the next year as a result of this protection from flood.

Other equally important dike problems were undertaken in 1925 in Hopei, including the closing of the breach at the east end of the famous Thousand Li Dike protecting a vast low-lying farming



No. 2 Check-gate on Saratsi Project



Grading new road at west end of Yungshou Hill, Shensi

area known as Wen An Wa. Local officials had tried and failed to do this work after the floods of 1924 had made this area an immense lake. Now, with the new dike built by our Committee, the Wen An Wa is again under cultivation, transformed from a fish pond covering more than four hundred square miles into a protected wheat farming region, as it had been in previous years.

During 1928 and 1929 the sum of $200,000.00 was expended in well digging in four southern counties of Hopei and six adjacent counties in Shantung. Nearly 2,000 wells were thus dug to assist in irrigating fields. Each well cost about $100.00 and the money was advanced as a loan for five years.

Financed by $5,000.00 given by Gen. Hsu Yung Chang, then Governor of Hopei, our engineers investigated the water resources in the western part of the province and studied the wells of three counties—Ting Hsien, Wuki and Shuntefu districts. A special report was issued by the Commission covering the results of these studies.

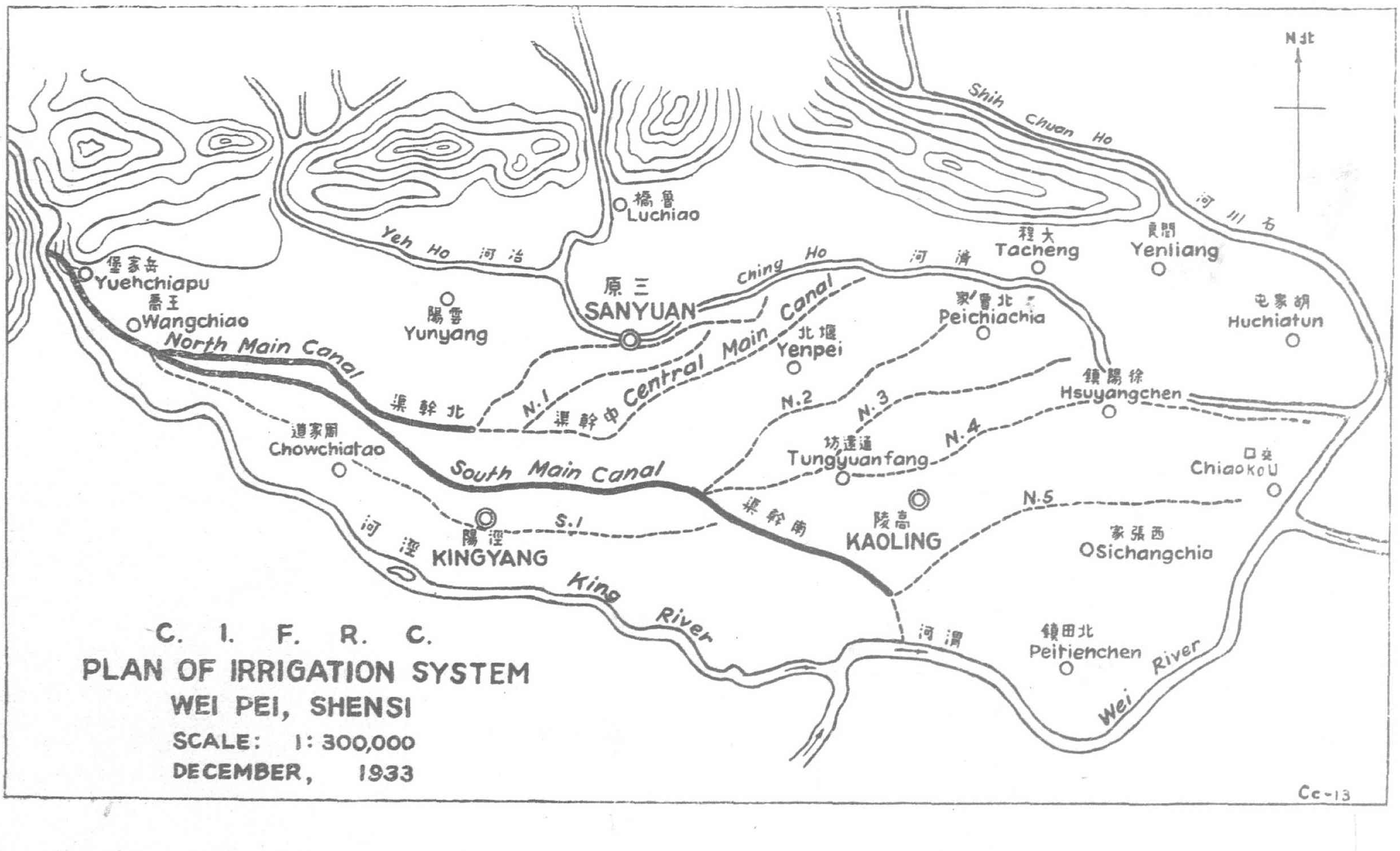
Preliminary studies were also made of the Tsu Ma Ho west of Kaopeitien as a source of water supply for irrigating the plains to the east. This would bring water to nearly 100,000 acres.

Tu Liu Flood Channel

A project that has taken no little attention of our engineers is the proposed Tu Liu flood channel for the protection of Tientsin from floods. It would tap the Hsi Ho 25 miles south-west of Tientsin and go east 45 miles to the sea. Its cost would be upwards of $8,000,000.00, including certain necessary special structures. Our Commission has advocated the building of this utility but thus far has not been able to work out a method of financing it even in conjunction with the provincial government. The time is not yet ripe in North China for flood protection of this extent.

Saratsi Irrigation Project

The building of the Saratsi Project in Suiyuan to irrigate drought stricken land began in June, 1929. The work was dedicated two years later after $750,000.00 had been expended on this project by the Commission's engineers and the western section was practically completed with head works, main canal, principal laterals, check gates, lateral head gates, bridges, etc. Further improvements both that year and later have followed to extend the usefulness of this utility. Over 250,000 acres will be served



C. I. F. R. C.
PLAN OF IRRIGATION SYSTEM
WEI PEI, SHENSI
SCALE: 1: 300,000
DECEMBER, 1933

by this canal system which takes water from the Yellow River near Tengkow for irrigating the plain to the east.

Roads in Shensi and Kansu

To give work to famine sections the Commission started to recondition roads in Kansu in 1929. During the following year this work continued in Kansu and a program of motor road construction was carried on in central Shensi near Sian where the sum of $200,000.00 was thus expended. The Kansu road work for 1929 and 1930 cost $500,000.00. These funds came from America to aid in fighting the famine.

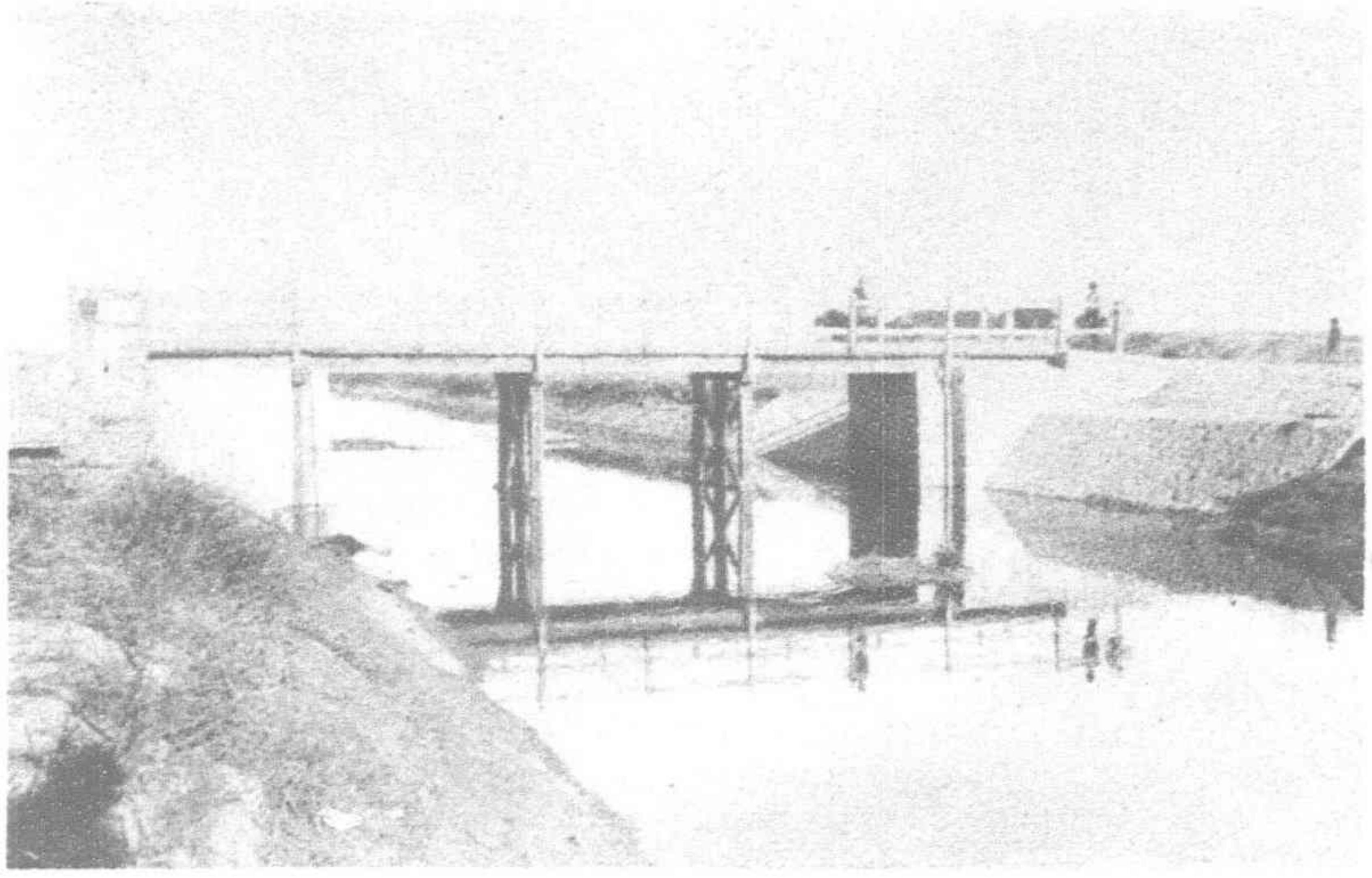
In 1931 the gift of $350,000.00 from China Famine Relief, U.S.A., for the Silan Road construction made it possible to start the regrading of bad hills from Sian to Lanchow and much was done to carry forward this program by the close of that year. It was trunk line motor road construction of an important nature.

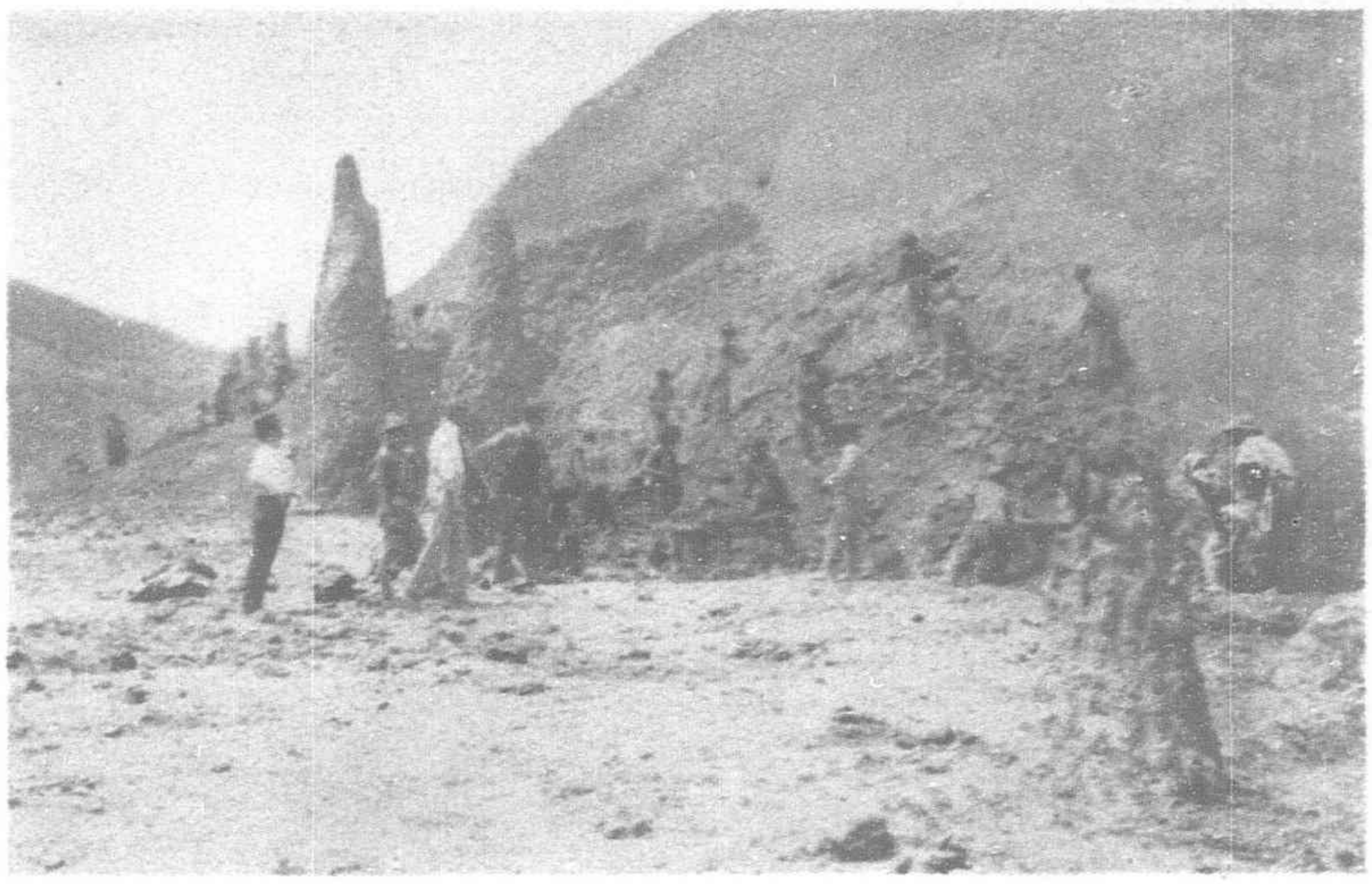
Activities of the C.I.F.R.C. 1921-1933 Inclusive

(Projects undertaken after 1931 are shown in heavy type.)

ROADS

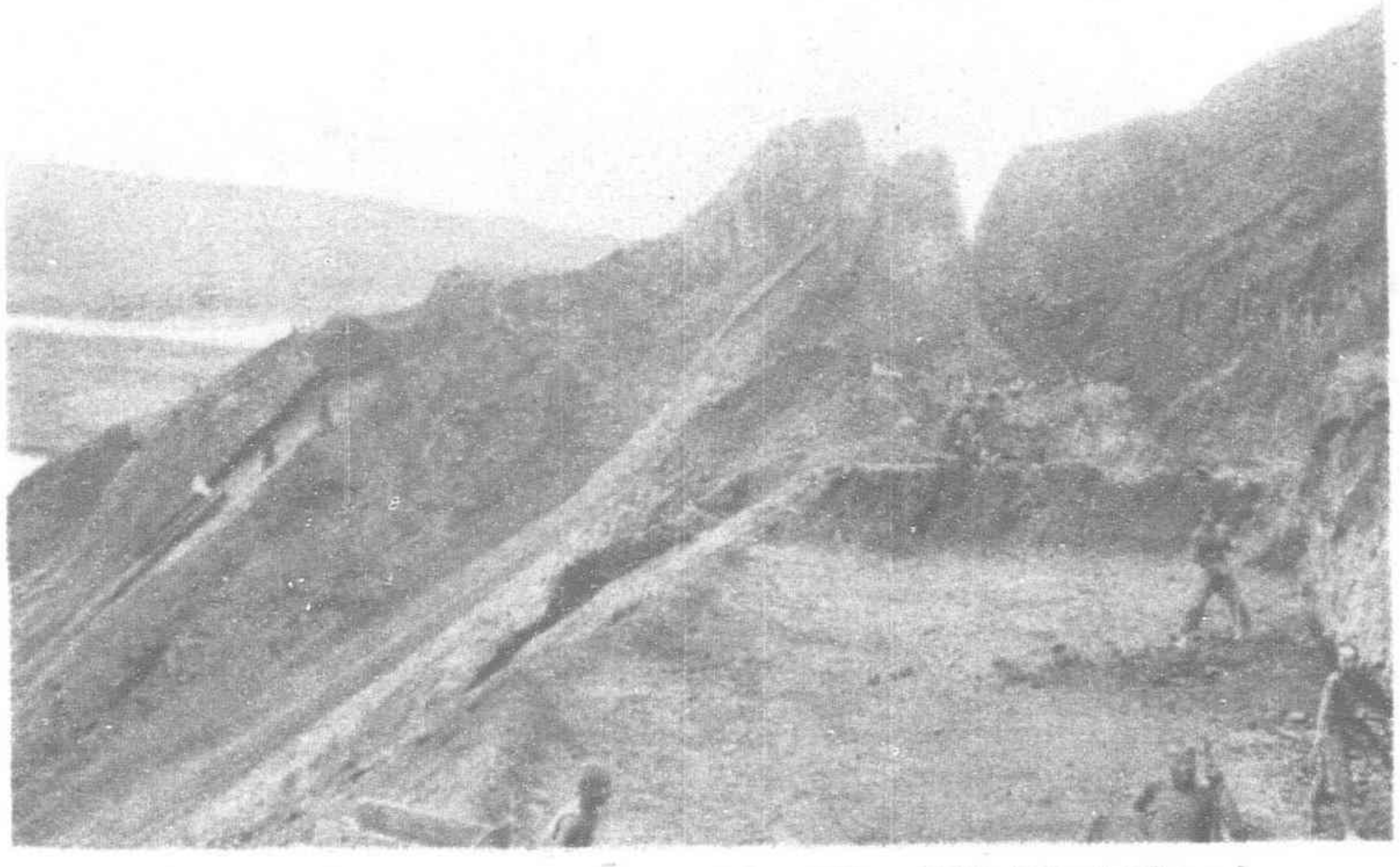
Province	*Name or Locality*	*Mileage*	*Cost*	*Remarks*
ANHWEI	Pengpu to Hwaiyuan ..	9	$50,000	New road (Part macadamized)
	Other roads ..	380	146,000	General repairs
HOPEI	Chengtingfu District ..	50	36,000	Repairs
	Hantan	60	14,000	Road repairs


Bridge over main canal near Lateral No. 7 converted into a check-gate with stop-log arrangement

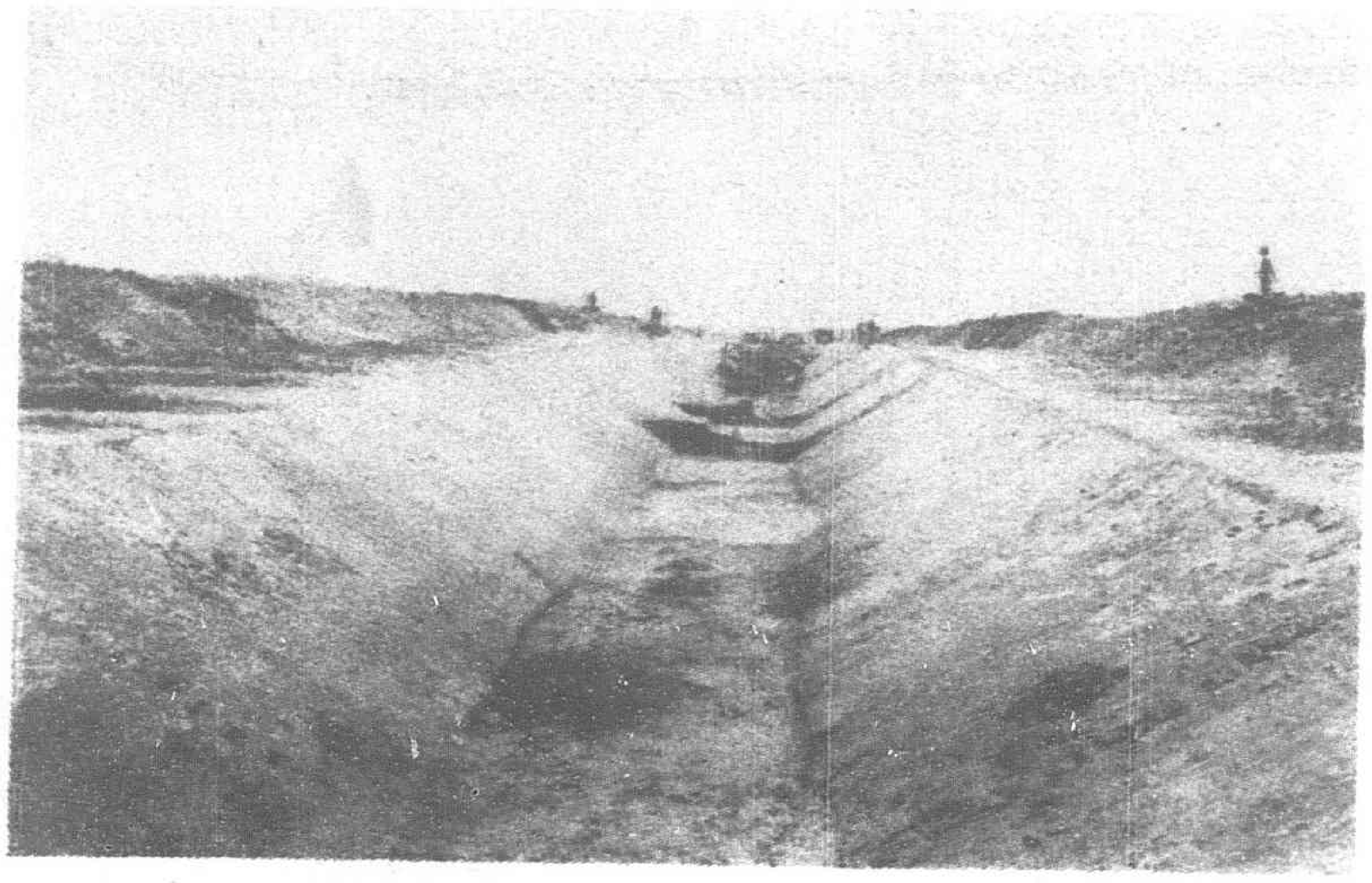

Bishop Roots, Dr. Sweet, Dr. Johnson (Dean of Canterbury) and Mr. Beckon inspect Silan Road construction on Taiyu Hill, Shensi

Heavy rock cut on east slope of Liu Pan Shan along new motor road

Sawing bridge timbers west of Ping Liang, Kansu


The new 7 per cent grade up Ting K'ou Hill, West Shensi

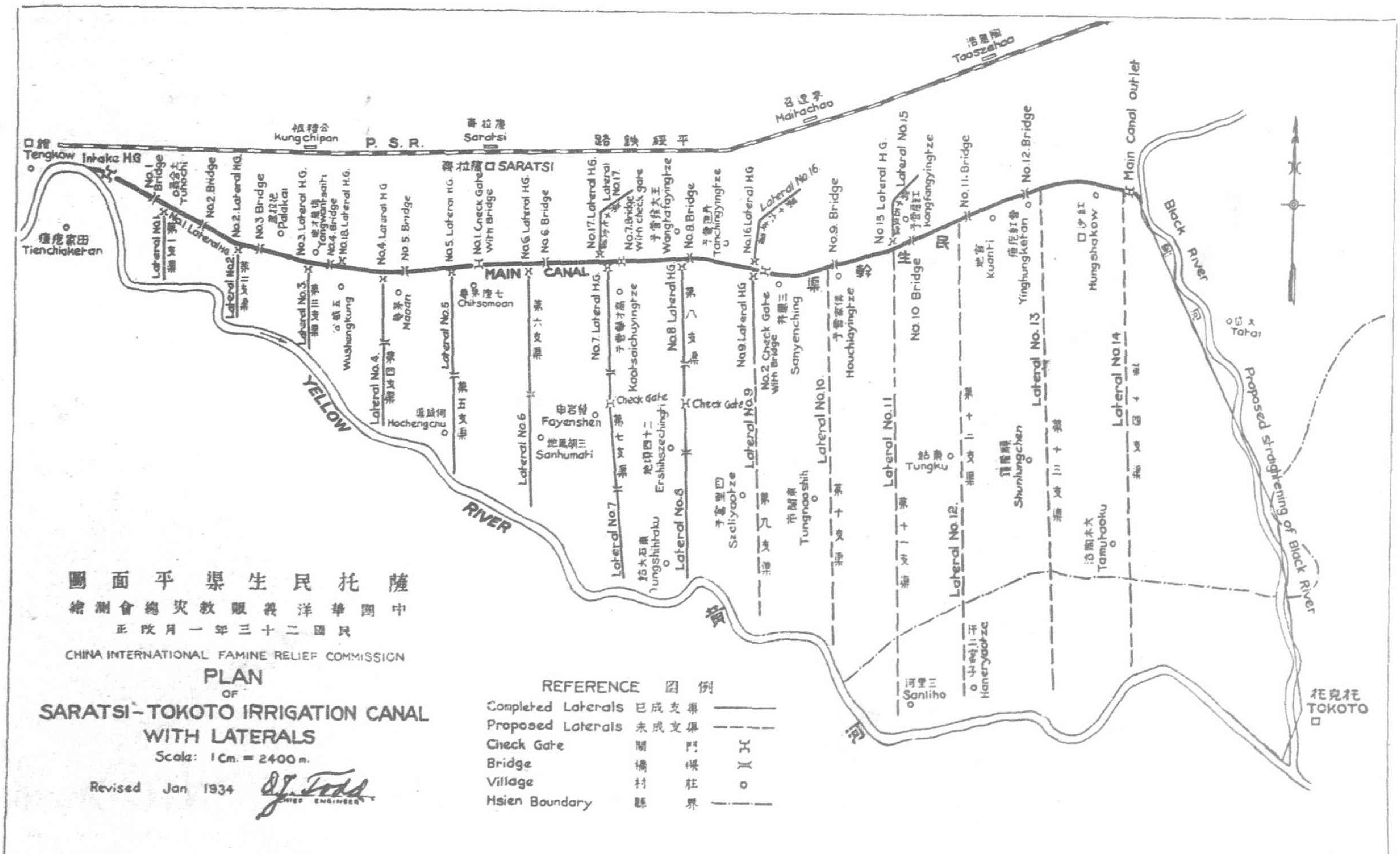
Site of earth bridge arches along new road six miles east of Lanchow



Completing Lateral No. 6 on Saratsi Project

Repairing dikes on Lateral No. 4, Saratsi Project

Province	*Name or Locality*	*Mileage*	*Cost*	*Remarks*
	Hantan-Wuan	18	67,000	New roads (surfaced)
	Shuntefu	31	10,000	Repairs
	Tingchow	7	11,000	New roads
HONAN	Scattered (29 counties) ..	423	170,000	,, ,,
	21 counties	295	110,500	,, ,,
	Kaifeng to Kweiteh ..	110	33,000	Road rebuilt
	Kaifeng to Yungcheng ..	157	30,000	Repairs
HUNAN	Siangtan to Paoking (1st half)	56	550,000	New road (gravel surface)
JEHOL	Lingyuan to Luanping .	95	9,000	,, ,,
KANSU	Tinghsi	15	12,500	,, ,,
	Chukiaking	7	7,680	,, ,,
	Ya Cuu Chuan	7	10,850	New road
	Kan Tsao Tien	10	31,910	,, ,,
	Lanchow-Hochow ..	50	58,000	,, ,,
	Lien Ta Ko	7	6,758	,, ,,
	Ti Tao	23	54,486	,, ,,
	Ping Fan	10	20,903	,, ,,
	Yungching-Maikaichi Kuan Shan-Tao Shia ..	50	75,000	,, ,,
	Hweining-Ching Liang Shan	17	25,500	,, ,,
KANSU	**Lanchow-Kan Tsao Tien**	**40**	**218,000**	New road
	Liu Pan Shan Section ..	**50**	**150,000**	,, ,,
	Kingchow Section ..	**80**	**50,000**	,, ,,
KIANGSI	**Nanchang**	**10**	**25,000**	,, ,,
KIANGSU	Chinkiang	7	20,000	Repairs
KWEICHOW	Anshun-Kweiyang-Tungtze	210	1,000,000	New roads (20% by C.I.F.R.C.)
SHANSI	Lin-fen to Puhsien ..	72	6,500	Repairs
	Taiyuanfu to Fenchowfu	60	70,000	New earth road
	Tsincheng to Yungchen .	18	3,700	New road and repairs
	Yuncheng to Maochintu	18	110,000	New road
	Houma-Yumenkow ..	45	22,000	,,
SHANTUNG	Chowtsun to Yellow River	45	60,000	New earth road
	Tsining to Tsaochowfu .	80	150,000	,, ,, ,,
	Wutingfu to Tungchangfu	150	66,000	Repairs to Red Cross Road, including bridges and culverts
SHENSI	Sianfu-Weinan	43	16,928	Road rebuilt
	Sanyuan-Chingyang ..	10	29,857	New road
	Chingyang-Hsienyang ..	24	27,105	Road repair
	Fengsiang-Fufeng ..	45	34,441	Road improvement
	Fufeng-Wukung ..	14	31,011	,, ,,

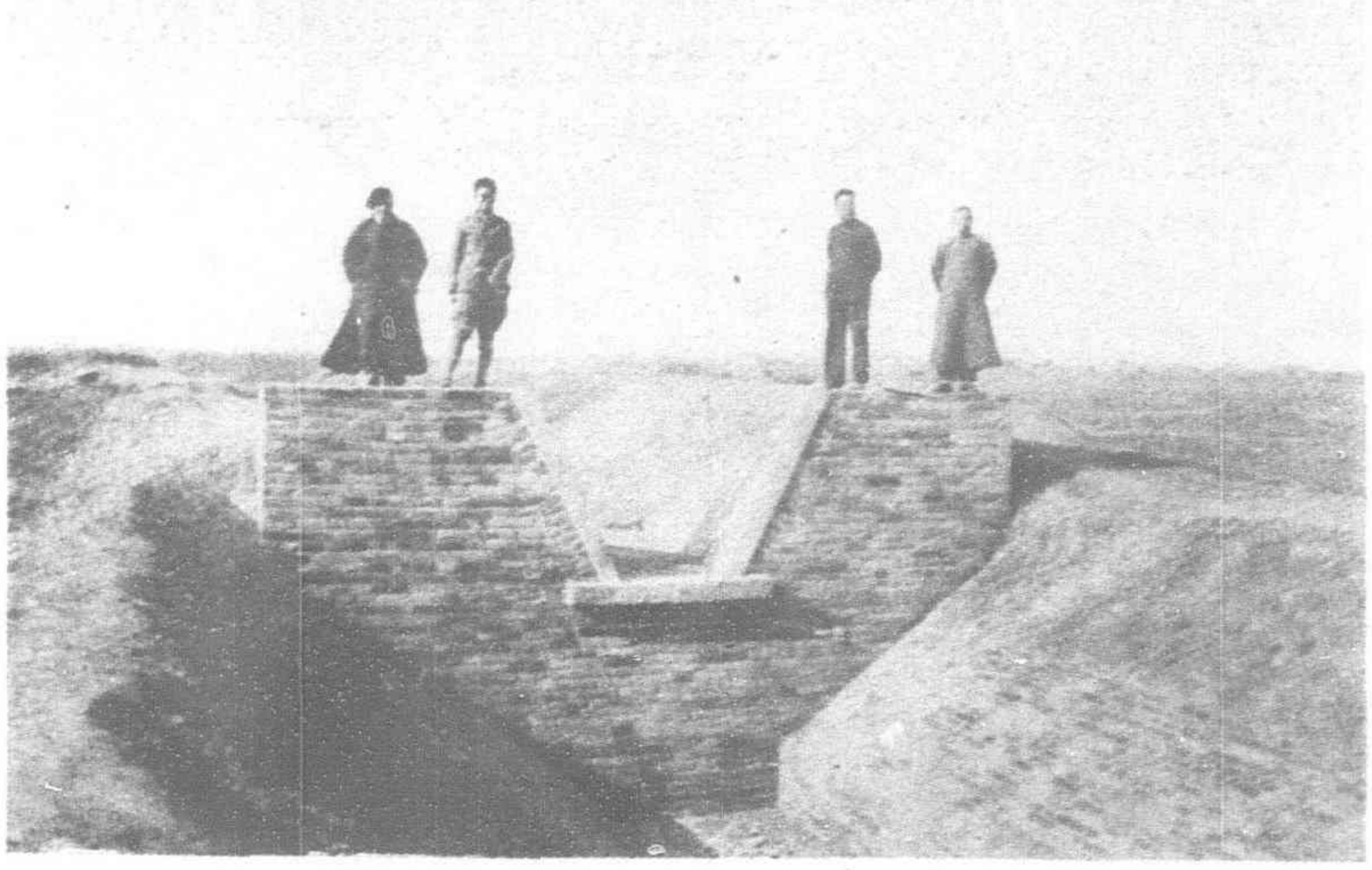


Province	*Name or Locality*	*Mileage*	*Cost*	*Remarks*
SHENSI	Wukung-Hsinping ..	30	13,092	Road regraded and resurfaced
	Wukung-Kienchow ..	22	24.184	Road improvement
	Kienchow-Lichuan-Hsienyang	37	5,000	Road repair
	Hsienyang-Petun-Mushuwan	26	11,730	New road
	Mushuwan-Chingyang .	18	1,100	Road improvement
	Road around Hsienyang .	1½	851	New road
	Lichuan Road	1	2,794	Road improvement
	Roads around Yuehchiapo	12	1,510	Road repair
	Hsienyang road work ..	13	276	,, ,,
	Changwu, Tingkow, Pinchow, Yungshou	**80**	**152,000**	New road
SUIYUAN	Pingtichuan-Taolin ..	46	5,000	New road
YUNNAN	Yunnan to Yangkai ..	69	250,000	.. ..
	Yunnan to Tapanchow ..	15	60,000	,, ,,

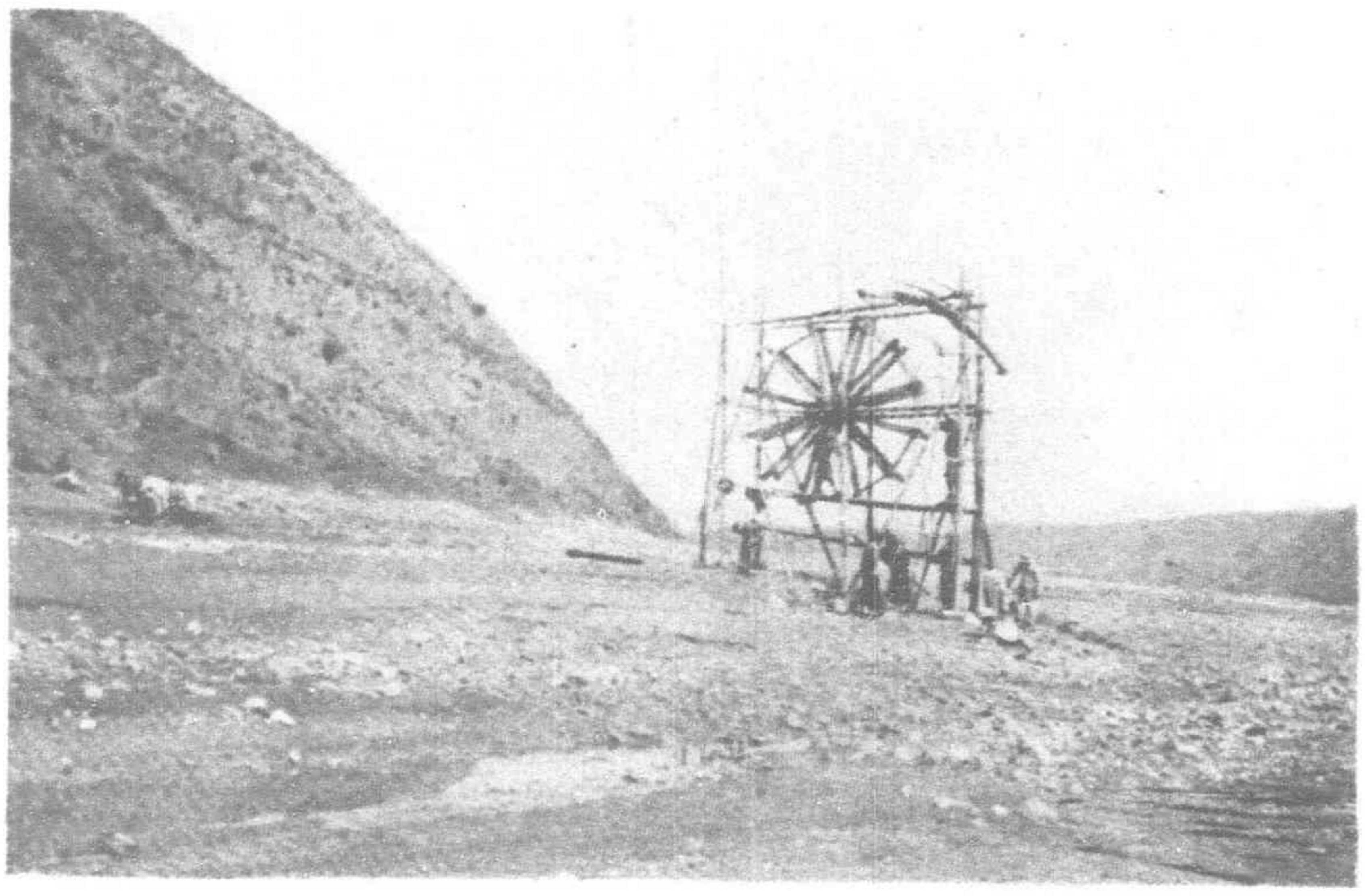
IRRIGATION DITCHES

Province	*Locality*	*Mileage*	*Cost*	*Remarks*
HOPEI	Hantan	10	$9,000	
	Hantan and north ..	20	36,800	
	Shih Lu	14	120,000	
HONAN	Loyang	13	12,000	
SUIYUAN	**Saratsi**	**187**	**824,618**	
SHENSI	**Wei Pei**	**46**	**806,364**	By C.I.F.R.C. staff.

Draining a Bad Hole in Broken Dike near Tuan Yao, 10 miles below Kiukiang



"V" Shaped Drop on South Lateral No. 1 of Wei Pei Project near Kingyang



Drilling for Bed Rock at No. 2 Dam-site on Upper Fen Ho

Where the Fen Ho leaves the Mountains near Lantsun

One of the Outlets of Lung Tze Sze Spring in Lower Fen Ho Valley, (90 to 100 second-feet flow)

Survey Party on three-day march from Shinchow to the Upper Fen Ho Reservoir

WELLS FOR IRRIGATION

Province	*Locality*	*Units*	*Cost*	*Remarks*
HOPEI	Chengtingfu	100	$ 5,000	Rain water cisterns
	Hantan and north ..	3,000	200,000	Brick lined wells
	Taming, Kuang Ping, Fei Hsiang, Wei Hsien	811	67,530	
SHANTUNG	En Hsien, Hsia Tsin, Wucheng, Liaocheng, Tang Yi, Kuan Hsien	1,125	101,080	

DRAINAGE DITCHES

Province	*Locality*	*Mileage*	*Cost*	*Remarks*
HONAN	Kaifeng	17 miles	$30,000	River cleaning
	9 other districts ..	179 ,,		
HUPEH	Hanchwan	2 ,,	20,000	Drainage canal
SHANTUNG	Chang Ching Hsien ..	10 ,,	36,617	New channel
	Ch'i Ho	55 ,,	61,500	Cleaning ditches

RIVER REVERSION

Province	*Locality*	*Mileage*	*Cost*	*Remarks*
HOPEI	Chochow River Regulation	7	$10,000	
SHANTUNG	Li Tsin Project (including rock filled diversion dam)	14	1,500,000	6 mile dike 1 mile new channel 7 mile channel cleaning. Of this total cost, $360,000 was donated by C. I. F. R. C.

DIKES

Province	*Locality*	*Mileage*	*Cost*	*Remarks*
ANHWEI	Hwai River	340	$192,000	Dikes and repairs
HOPEI	Fu Ho and West Lake ..	50	260,000	Repairs to breaks of 1924
	Thousand Li Dike ..	2	30,000	,,
	Paotingfu	20	13,000	Repair
HONAN	Yellow River	6	90,000	Dikes
	Other dikes	30	63,000	,,
HUPEH	Han River	18	655,500	,,
	Yangtze River	60	911,100	Incl. Shih Show Dike
	Chang Kung Dike ..	11	90,000	
	Yangtze River	**35**	**200,000**	**Reconstruction and Repair**
KIANGSI	Kan River	90	200,000	
	Yangtze River	**45**	**300,000**	**Reconstruction and Repair**
	Nanchang area	**134**	**170,000**	**Repairs**
SHANTUNG	13 counties along Yellow River	60	203,000	
	Yellow River	3	90,000	

SURVEYS

Province	*District*	*Cost of Surveys*	*Estimated Cost of Project*	*Nature of Project*
HOPEI	Ningchin	$1,000	$ 50,000	Flood control
	Wen An Wa, West Lake and Vicinity	3,000	300,000	,, ,,
HONAN	Nanyang-Hsuchow ..	777	6,996 (already spent for construction)	Motor road
SHANTUNG	Yellow River	4,000	1,500,000	Motor road
SUIYUAN	Hotao	5,000	2,000,000	Irrigation
SHANSI	**Fen Ho Conservancy ..**	**56,000**	**12,760,000**	**Flood control and irrigation**

STANDARD HIGHWAYS BUILT BY THE AMERICAN RED CROSS, 1920-1921.

Province	*Name or Locality*	*Miles*	*Average Unit Cost*	*Total Cost*	*Type of Road*
			$	$	
HOPEI	Hantan-Taming ..	46	2,826	130,000	Earth (some lime concrete surface)
	Tientsin to Paotingfu	75	773	58,000	Earth
	Tientsin to Tungchow (part way) ..	12	4,667	56,000	Earth (part surfaced)
HONAN	Several short roads ..	39	2,560	100,000	Macadam
SHANSI	Pingtingchow ..	80	7,000	560,000	Broken stone surface
	Pingyao	30	2,067	62,000	Earth (part gravel surface)
	Yellow River	83	7,771	645,000	Gravel surface
SHANTUNG	Continuous net-work north of Yellow River	485	1,719	834,000	Earth
	Total	850		$2,445,000	

Fen Ho Conservancy, Proposed Plan

Based on our investigation of 1933 the following steps are recommended in connection with the solution of the flood control and water conservancy problem of the Fen Ho.

1. Construction of a dam on the upper Fen Ho near Hsiachingyiu for storing winter flow for spring irrigation.
2. Constructing reservoirs just below the three large springs—Chintze. Kwang Sheng Sze, and Lung Tze Sze—to impound winter flow for spring irrigation.
3. Improving four irrigation projects along the Fen Ho as follows:—Tung Li, Hsiang Ling, Chiangchow and Hotsin.
4. Straightening the Fen Ho channel between Taiyuanfu and I Tang—a 70 mile stretch—and building two sets of dikes uniformly spaced and with stone protection to the inner dikes.
5. Improving the Wen Yu Ho in its lower stretches as a means of flood protection to the Taiyuan plain.

COST OF FEN HO CONSERVANCY PROGRAM

1.	Dam on upper Fen Ho and land damage for storage reservoir	$2,000,000
2.	Three reservoirs at three large springs	1,000,000
3.	Improving four irrigation projects along Fen Ho—Tung Li, Hsiang Ling, Chiangchow and Hotsin	500,000
4.	Leading channel and inner earth dikes for Fen Ho from Taiyuan south 70 miles	550,000
5.	Outer earth dikes for Fen Ho from Taiyuan south ..	450,000
6.	Stone facing of inner dikes of Fen Ho for 70 mile stretch continuous revetment work 1′ × 30′=nearly 200,000 fangs @ $25.00	5,000,000
7.	Wen Yu Ho improvements	1,000,000
8.	Connection roads to get to up-river reservoirs and large springs	500,000
	Total construction costs net	$11,000,000
	Contingency and special equipment @ 10%	1,100,000
	Engineering, general supervision and overhead @ 6%..	660,000
	Grand Total for Five Year Plan	$12,760,000

TANGIBLE BENEFITS

1.	Annual increase in crop values due to irrigation ..	$600,000
2.	Annual saving in buildings, livestock, etc., due to protection from flood	1,000,000
3.	Annual increase in land value for first five years due to irrigation improvements	2,000,000
4.	Annual increase in land values for first five years due to flood protection in Taiyuan plain	2,000,000
	Total annual benefits during the first five years.. ..	$5,600,000

Saratsi Irrigation Project Proposed Four Years Plan of Development

This plan is based on the assumption that out of a possible area of 2,000,000 *mou* of land that may eventually be served by this canal system, there will likely be 1,200,000 *mou* from which water taxes can be collected beginning in 1937. For 1934 it is assumed that a tax of but 10 cents per *mou* can be levied on 200,000 *mou*. This should increase in 1935 to 600,000 *mou* to pay a tax of 20 cents per *mou* that year. This rate may continue for a number of years.

1934 (1st year)

(*A*) Intake and Main Canal Improvements and Repairs.

1.	Repair and extension to north-east bank protection..	$1,500
2.	Building four culverts to take mountain water through north dikes into main canal	8,000
3.	Excavation of silt and sand from main canal ..	30,000
4.	Repairs to dikes at Wushengkung	500
5.	Repairs to canal banks and dikes east of No. 2 Check-gate	2,000
6.	Drainage canal at Black River end	6,000
	Total for this group	$48,000

(B) Repairs to Laterals.

1.	5th Lateral : repair canal dikes..	$1,000
2.	6th ,, ,, ,, ,, ...	5,000
3.	7th ,, ,, ,, ,, ...	5,000
4.	8th ,, ,, ,, ,, ...	1,000
5.	9th ,, ,, Intake	300
	Total for this group	$12,300

(C) Construction New Laterals with Bridges.

1. 9th lateral extension 18 *li*	$7,200
2. Two wooden bridges on same	3,000
3. 12th Lateral : excavating 25 *li* canal	10,000
Three wooden bridges on same	4,500
One lateral check-gate	1,500
One main canal check-gate	5,000
Total for this group	$21,000
(D) Repairs to Main Structures	$3,500
(E) Sub-laterals in Aid of Farmers	10,000
(F) Staff Salaries and Travel and Housing	10,000
Total expense for 1934 operations	$125,000
Water tax collectible on 200,000 *mou* @ 10 cents	20,000
Balance of 1934 loan outstanding at end of season after collecting tax on water	$105,000

1935 (2nd year)

(A) Intake Repairs and Main Canal Improvements.

1. Repairs and extensions of north-east bank stone protection	$2,000
2. Excavation of silt and sand from main canal	30,000
3. Upkeep of structures	3,000
4. Constructing submerged weir and bi-pass channel at Intake	150,000
Total expense for this group	$185,000

(B) Construction of New Laterals.

1. Lateral No. 11 : earthwork 20 *li* new canal	$8,000
Three wooden bridges for same	4,500
One lateral check-gate for same	1,500
Lateral head-gate for same	2,000
2. Lateral No. 14 : earthwork, 50 *li* new canal	20,000
Six wooden bridges for same	9,000
Lateral check-gate for same	3,000
Lateral head-gate for same	2,000
Total for this group	$50,000
(C) Staff Salaries for Construction	$10,000
(D) Staff Salaries, Travel, Housing, etc., for Maintenance and Operations	10,000
Total expense for 1935 operations	$255,000
Water tax collectible on 600,000 *mou* @ 20 cents	120,000
Balance of 1935 loan outstanding at end of season after collecting tax on water	135,000
Balance of 1934 loan outstanding	105,000
Total loans outstanding, January, 1936	$240,000

1936 (3rd year)

(A) Cleaning Main Canal	$10,000
(B) Constructing Lateral No. 13	
Earthwork, 35 *li* new canal	14,000
Five wooden bridges	7,500
One lateral check-gate	1,500
Head-gate for same	2,000
(C) Staff Salaries and Overhead for Operation, Building and Maintenance	25,000
Total expense for 1936 operations	$60,000
Water tax collectible on 1,000,000 *mow* @ 20 cents	200,000
Surplus earned in 1936 over expenditure	$140,000
Loans outstanding January, 1936	240,000
Total loans outstanding January, 1937	$100,000

1937 (4th year)

(A) Cleaning main canal and all repairs	$20,000
(B) Staff salaries and all overhead	30,000
Total expense for 1937 operations	$50,000
Water tax collectible on 1,200 *mou* @ 20 cents	$240,000
Surplus earned in 1937 over expenditure	$190,000
Loans outstanding, January, 1937	100,000
Total surplus after paying all loans as of January, 1938	$90,000

The above Four Year Plan contemplates an economical construction program aided by the provincial authorities so that local labor will be obtainable at moderate rates from April to November with most of the work being done in May and June as far as construction is concerned. But there must be a regular rule for getting workers from the regions to be benefited and this should be worked out on a population basis.

It will be noted that the taxable land where water rates are to be collected keeps increasing in area from 200,000 *mou* in 1934 to 1,200,000, *mou* in 1937. This latter figure continues for the following year though it is possible to collect from additional areas where light pumping is required. This may be at a lower rate per *mou*.

The annual expenditures after 1937 may be figured at $50,000.00 as they are for 1937. The revenue may also be figured at $240,000.00 for 1938 and after that. This gives an annual net return of $190,000.00 from 1,200,000 *mou* of land to be served by gravity feed. This will carry an annual tax of 20 cents per *mou* and the tax must be collected every year. Taxes on areas in excess of this area of 1,200,000 *mou* can be used for agricultural improvements, possible digging of Lateral No. 10, etc. The last named lateral is being omitted from this plan as it is thought more economical to use Lateral No. 9 to feed across to Lateral No. 11. To construct Lateral No. 10 with structures may mean an additional $15,000.00. This can be done in 1938 if desirable.

It will be noted that the construction of the submerged weir is scheduled for 1935 as insurance against low water periods that may impede getting water to these lands in all the spring months.

The loan needed under this plan will be $125,000.00 for 1934. Then an additional $235,000.00 aside from the 1934 water rates equalling $20,000.00 must be supplied for the 1935 program. Part of this last $235,000.00 will be needed for six months only as the 1935 water rates should furnish $120,000.00 But by April, 1936, funds for the third year must be ready. These will total $60,000.00. That means the project will have total loans of $300,000.00 against it by the fall of 1936 when taxes are due for that year amounting to $200,000.00.

Maximum debts for the four years are as follows and occur in late summer:

	Max. debts	*Earnings*
1934	$125,000	$20,000
1935	360,000	120,000
1936	300,000	200,000
1937	150,000	240,000

Yearly expenditures planned are as follows:

	Expenditures
1934	$125,000
1935	255,000
1936	60,000
1937	50,000
4 years	$490,000

Silan Road—Proposed Macadamizing for 1934

Location of Work		*Length*
East of Yungshou	Macadamize	6 miles
Yungshou to Taiyu	,,	10 ,,
Taiyu to Pinchow	,,	2 ,,
Pinchow to Tingkow	,,	10 ,,
Tingkow to Changwu	,,	3 ,,
Changwu to Shensi—Kansu border	,,	2 ,,
Kansu border to Kingchow	,,	10 ,,
Kingchow to Pingliang	,,	20 ,,
Pingliang to Wating	,,	2 ,,
West of Liu Pan Shan	,,	5 ,,
Total length to be macadamized		70 miles

NOTE:—With metalling or macadam 12 feet wide one fang of stonewill cover approximately 15 linear feet of road—352 fang per mile. Figuring average haul of materials at four miles, by local means this surfacing in place will cost nearly $13.00 per fang or $4,500.00 per mile.

COST TABLE FOR PROPOSED MACADAMIZING

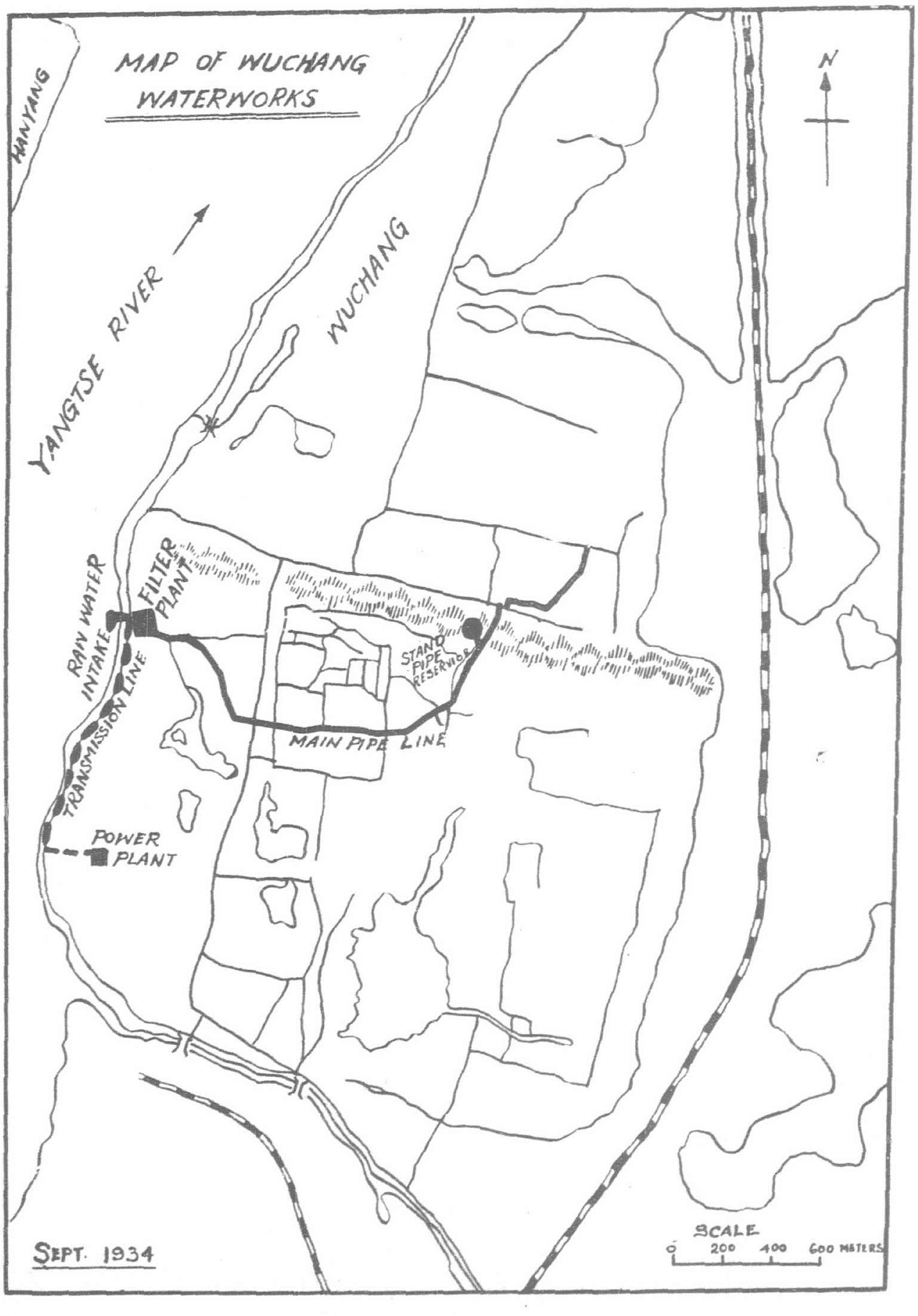
1. Metalling 70 miles @ $4,500	$315,000
2. Stone reserves along road	20,000
3. General overhead	25,000
Probable cost for 70 miles	$360,000

The Wuchang Waterworks

For the last decade, several proposals and schemes were submitted for the construction of a waterworks in Wuchang, the provincial capital of Hupeh, opposite the Yangtze central port of Hankow. Wuchang has a population of 300,000 and is in great need of a system for supplying clear and hygienic drinking water. Due to various causes, this important construction has only lately been completed in its first stage for a capacity of 5,000 metric tons per day, or one million U.S. gallons approximately. The work started in June, 1933, and water has been pumped since last March.

The project is being carried on under the auspices of the Bureau of Reconstruction with Commissioner Li Van-yi directing. While design and construction are entrusted to Mr. Jameson Y. Chang, Engineer of the Bureau. Limited by funds of only $50,000. in addition to available materials in stock valued at about the same amount, the success achieved thus far warrants congratulations.

A map of the Wuchang city showing the location of the water intake station, filter plant, pipe line, stand pipe reservoir, power plant, appears herewith and the plan of the filter plant also is shown. General description of the plant may be summarized from the data given below :



(A) Prime Mover.—The type of Prime Mover is of Hor., double-cyl., 4-stroke, made by Messrs. Ruston & Hornsby, England, and has power of 200 b.h.p. and speed of 200 r.p.m. The Alternator maker is ASEA, Sweden, and is of the revolving field type. The output is 60 kva. at a speed of 1,000 r.p.m. and voltage of three-phase, 380-volts and frequency of 50-cycles per second with belt driven system. The D.C. Exciter is direct coupled.

(B) Power Transmission.—The distance of line for Power Transmission is 1,200 meters and 35 poles of 10 m. by 10 cm. diam. top each are used. The distance of span is 35 meters. The wire is of bare copper and of 10 Strand S.W.G. No. 12, weighing 17,500 kg.

(C) Raw Water Pumping Plant (on Pontoon).—The type of pump is of Centrifugal, Single Stage, made by Messrs. Sin Chung Engineering Co., Shanghai. The output for each two sets is 100 tons per hour or 450 U.S. gal. per min. The Head is 3-2 meters. The suction is 125 mm. or 5-in. and delivery, 100 mm. or 4-in., with belt driven system at a speed of 750-1,500 r.p.m. The type of Electric Motor is of slip ring, made by Siemens Schukert Werke, Germany, and has power of 11 kw. or 15 h.p. for each two sets and speed of 1,430 r.p.m. The voltage is of three-phase, 380-volts.

(D) Coagulation Plant.—The construction of the Coagulation Plant is of reinforced concrete with brick abutment having overall length of 33.1 meters or 176-ft. 4-in. and width, 19.6 meters or 64-ft. 4-in. The height is 3.6 meters or 12-ft. 0-in. The plant has a capacity of 3,350 cu.m. or 122,100 cu. ft. and the travel of water is 200 meters. The coagulation period is 12 hours and the mean velocity is 28 cm. or 11-in. per second. The type of partitions is of 1-in. T. & G. planks.

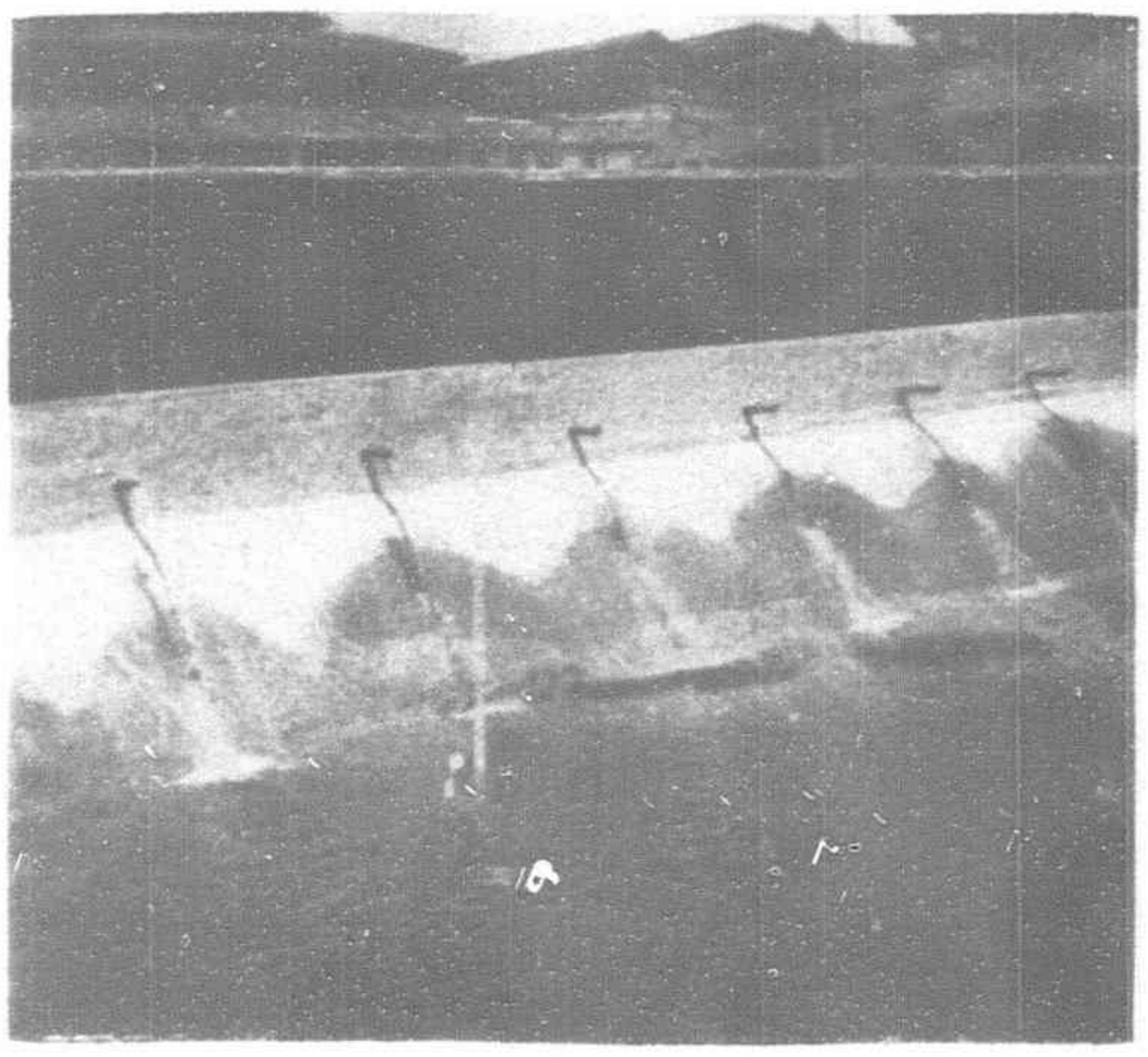
(E) Rapid Filter Plant.—The type of the rapid filter plant is Patterson, having ten sets of tanks with $\frac{1}{4}$-in. steel plate. The size of each tank is diam. 2.9 meters or 9-ft. 7-in. and height 3.6 meters or 11-ft. 10-in., each having filter area of 6.3 sq. m. at the rate of five tons per sq. m. per hour. The total output is 7,500 tons per day.

(F) Clear Water Reservoir.—The length of No. 1 Reservoir is 29 m. or 95-ft., width, 19.5 m. or 64-ft. and depth, 6.5 m. or 21-ft. 6-in. The length of No. 2 Reservoir is 19.5 m. or 64-ft., 7 m. or 23-ft. and depth, 3 m. or 10-ft. The capacity of No. 1 Reservoir is 800 tons and that of No. 2 is 400 tons.

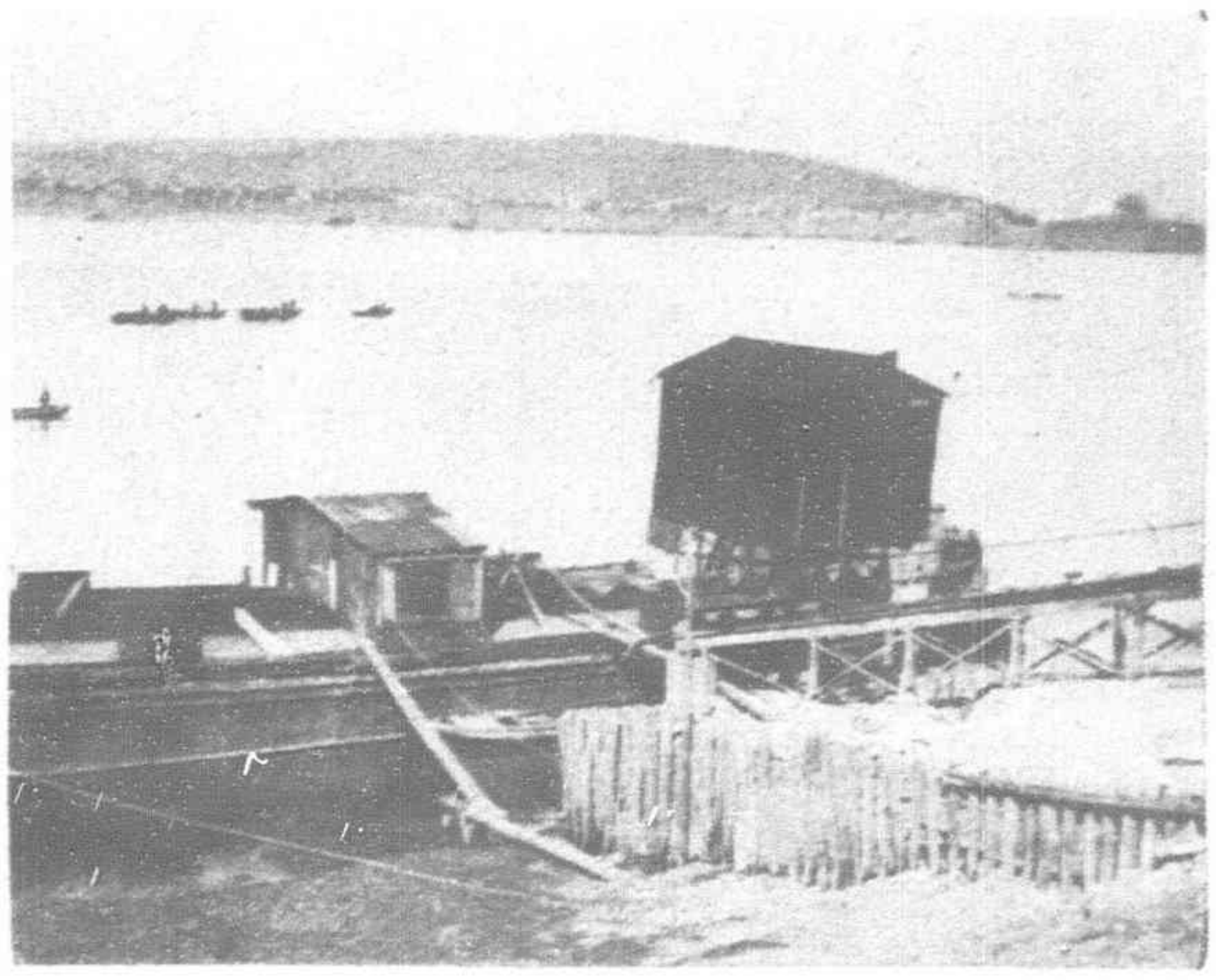
(G) Clear Water Pumping Plant.—The type of the pump is of Centrifugal, three stages, made by Messrs. Sin Chung Engineering Co., Shanghai. The output for each two sets is at 100 tons per hour or 450 U.S. gal. per min. The Head is 64 meters and connections of 125 mm. or 5-in. suction, and 100 mm. or 4-in. delivery at a speed of 1,450 r.p.m. The driving system is direct coupled to the electric motor of slip ring, made by Siemens Schukert Werke, Germany, having power for each two sets of 30 kw. or 41 h.p. and voltage of three phase, 380-volts.

(H) Main Pipe Line.—Cast iron pipes made in Germany and supplied by Carlowitz, Hankow, are used and the size, diam. is 250 mm. or 10-in. in four meters length, covering a distance of km. Balls and sockets are used for joints. There are eight pieces of gate valves along the line.

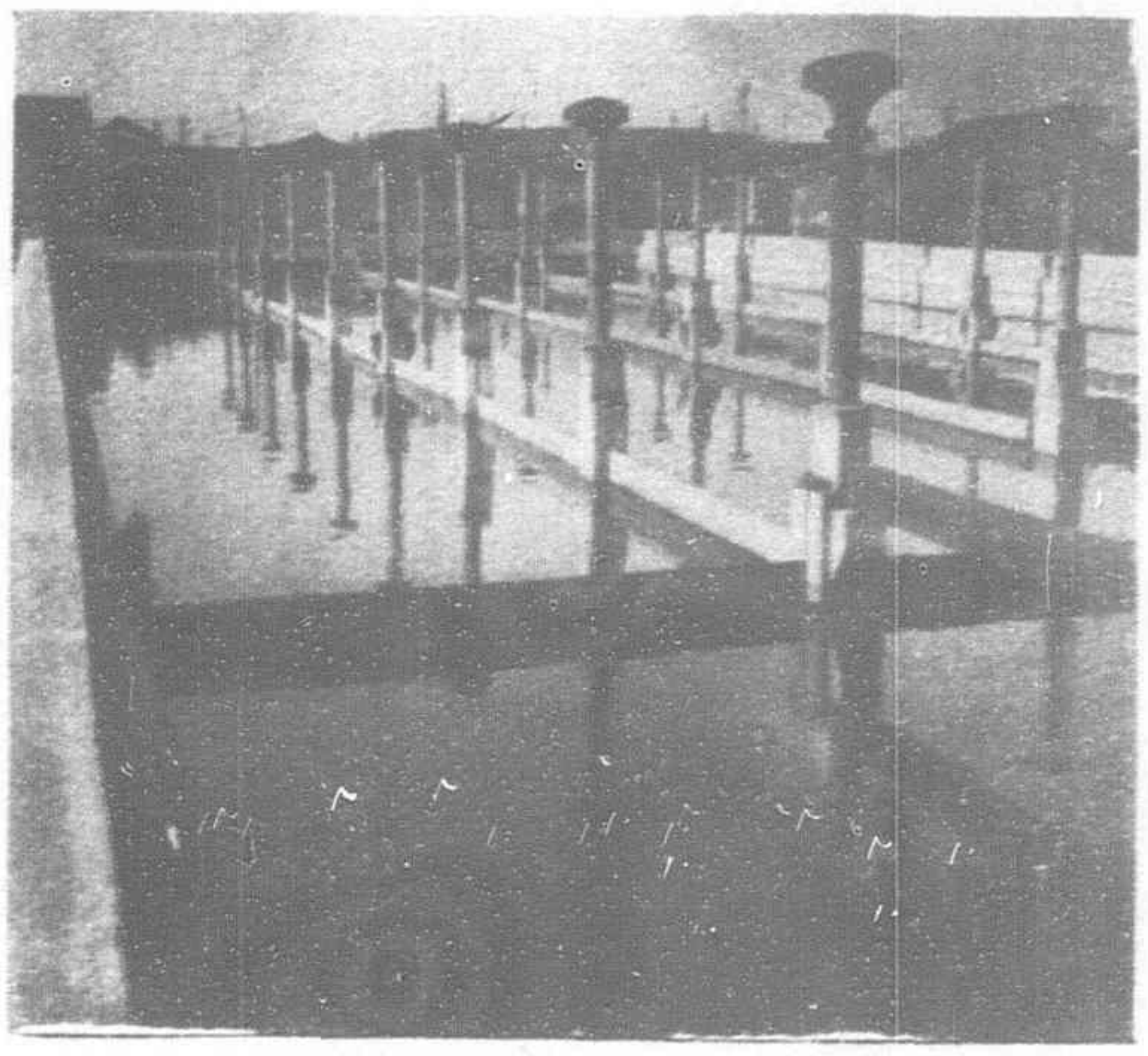
(I) Stand-Pipe Reservoir.—Steel plates of $\frac{5}{16}$-in. thickness are used, each having a diameter of 13.7 or



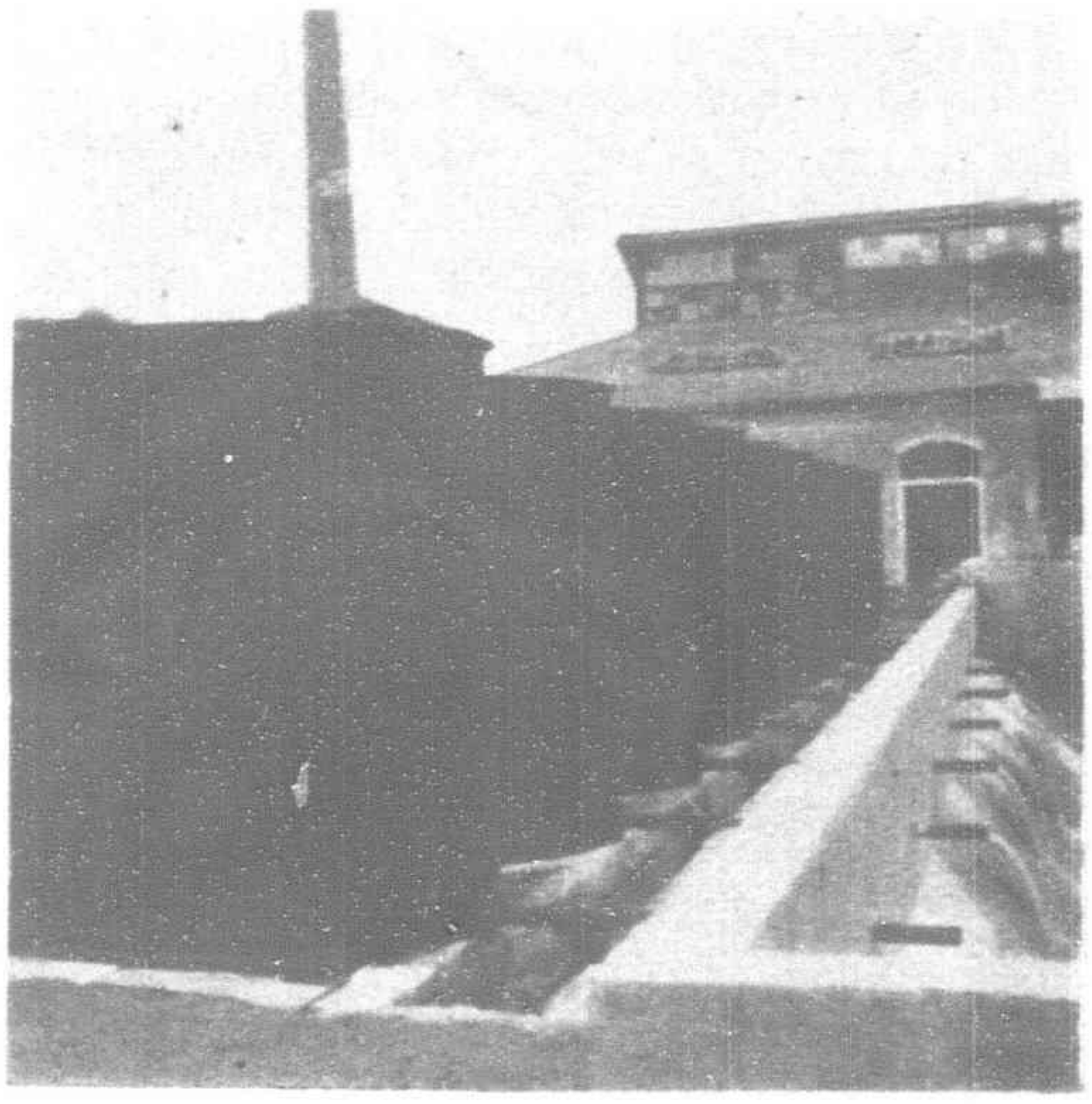
Clear Water Reservoir 1



Raw Water Pumping Intake 2

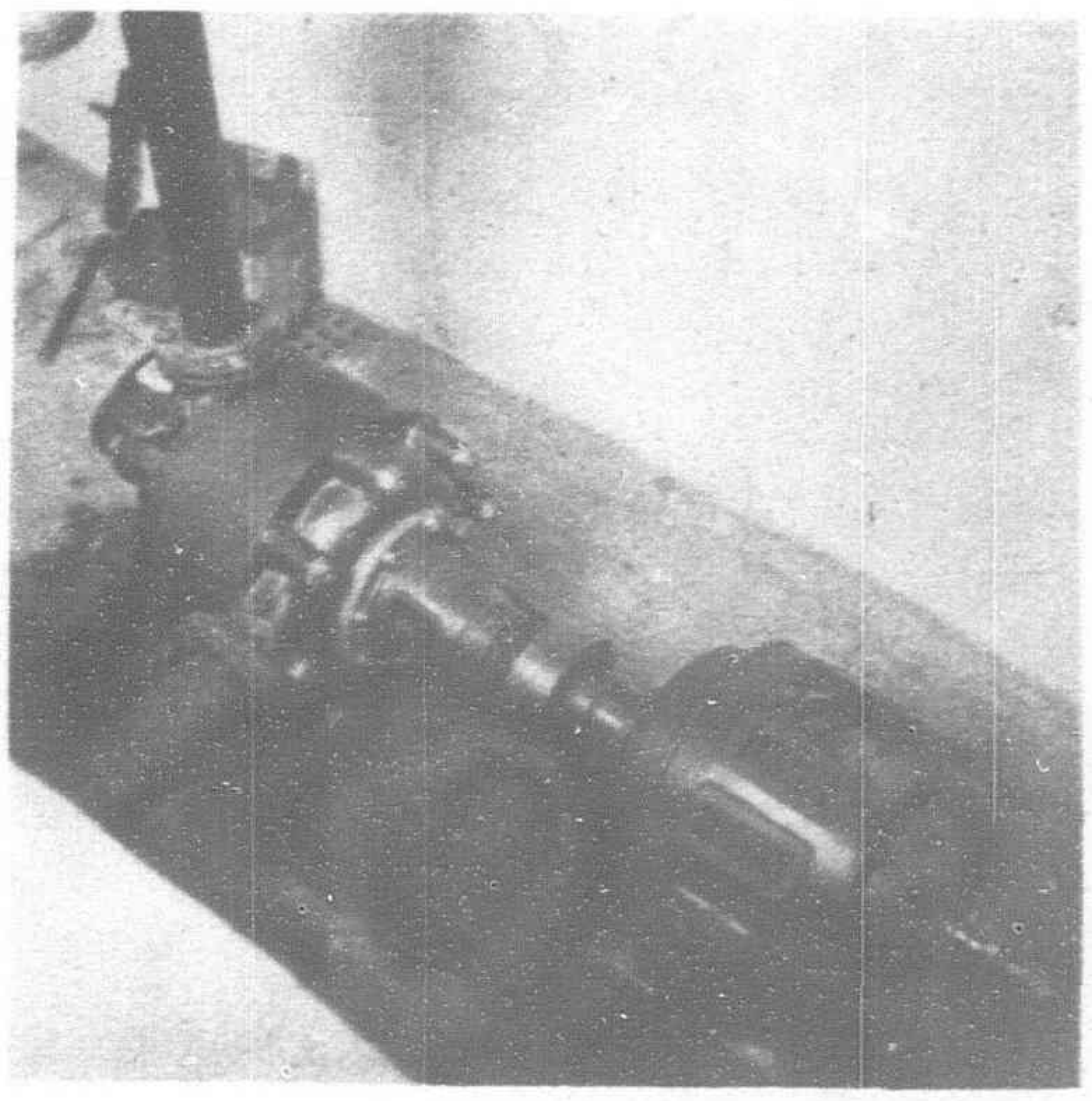


3 Coagulation Plant

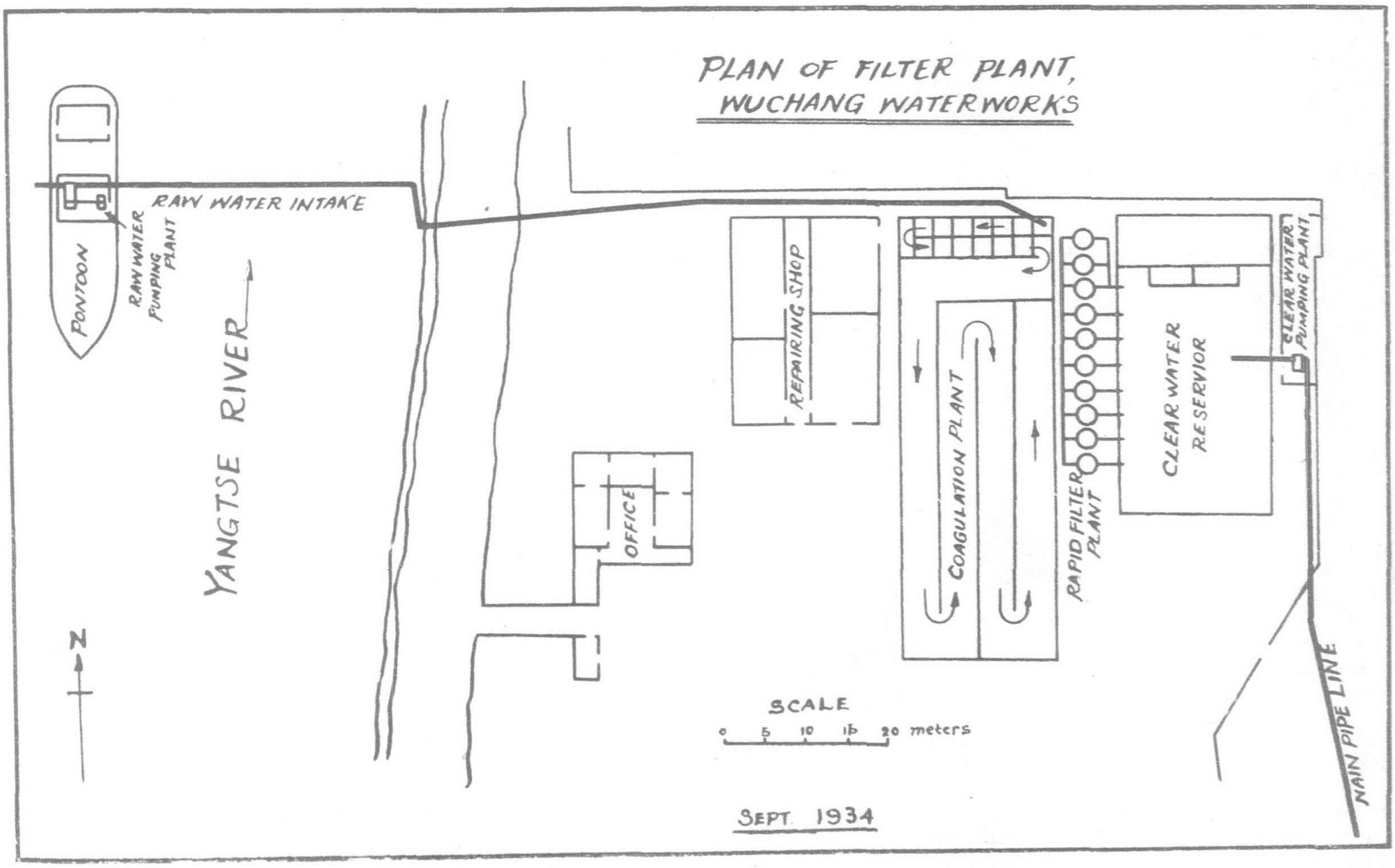


Rapid Filters 4

Stand-Pipe Reservoir 5



6 High Lift Pumps



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45-ft. and height of 5.9 meters of 19-ft. 2-in. The capacity of the reservoir is 900 tons.

(J) **Branch Pipe Line.**—The branch pipe line has a diameter of 150 mm. or 6-in. and 125 mm. or 5-in. There are five pieces gate valves along the line together with 14 hydrants.

As house connections are not yet available at the present time, water is distributed by carts and carriers. Water in two standard tubs of 25 liters each is equal to a catty and is delivered to houses from the hydrants by carriers at the low rate of 60 cents per month, for every catty per day. For houses farther than half a kilometer from the hydrants, the charge is 90 cents and over one kilometer, $1.20. The retail sale of water at the hydrant is charged at one cent per catty. Their services were much appreciated and praised during the drought season this year.

Schemes on large scale for waterworks of 2,000 tons or four million gallons per day, combined with electric power plant of 4,000 kw. capacity will soon be realized under direction of the Bureau of Reconstruction which is solving the utility problems of Wuchang, concerning water, light, power and tramways with one whole installation.

Manchuokuo A Going Concern

(Continued from page 11)

generation led by younger men, many educated abroad, pressed forward new ideas and ideals. After twenty years of chaos there now seems to be emerging a central government at Nanking with General Chiang Kai-shek as the leading figure. He has developed an army with mechanical equipment and some air-planes. He is making progress against the Communists in the south. By personal contacts and increased prestige he seems to be gathering a strength which is making rebellion less popular and profitable.

Communications Being Built

The Nanking government is pushing road building, railroads, telephones and airplane services as aids to administration. A great deal depends in the immediate future on the success or failure of this effort to form a central Chinese government.

The New Life Movement, which seeks to spread patriotism and improve living conditions, is much talked of. Mrs. Chiang Kai-shek and Mrs. Kung, wife of the Finance Minister, both sisters of Mrs. Sun Yat-sen, are its ardent supporters. These three sisters were educated in America, two at Wesleyan College, Macon., Ga., and one at Wellesley. Two of their brothers, T. V. Soong, formerly Finance Minister and T. A. Soong, were graduated from Harvard and a third brother from Vanderbilt.

This group and many leaders of the younger generation, gaining in power, firmly believe in a modern administration of government as opposed to the antiquated mandarin system in vogue under the emperors. There is an atmosphere of hopefulness that a united China may be achieved and modernization begun on a large scale.

A Huge Project

It is a vast undertaking. The present beginnings may crumble at any moment, but the leaven of education is clearly working in the right direction. Japan and Russia at the door give a strong political incentive for national unity. One young man said: " Give us ten years of peace and we will gain strength enough to speak as a nation." Another asked for twenty. An outstanding Chinese, educated in America, warned against a too rapid change.

The other great influence is the recent adoption of a nationally printed language to be used in all the schools. Many different dialects are spoken in China. A universal means of exchanging ideas cannot fail to contribute greatly to national unity.

What the political developments, domestic and international, may be is difficult even to estimate. But there is no doubt that in China and Japan 500,000,000 persons are rapidly changing their habits of life, developing their national equipment, and, above all, acquiring a firm ambition to become a factor and influence in world affairs.

Radium Found in Japan

Hereafter Japan will not have to depend on imports of radium, the supply of which is now practically monopolized by the Belgian Congo. On the contrary, she will be able to export what surplus she may have on hand, inasmuch as a large radium vein was recently struck in Yamaguchi prefecture, which is said to be second only to that in the Belgian Congo.

The discovery is credited to Dr. Sokichi Taka, professor emeritus of Kyushu Imperial University, who while examining the region concerned at the request of its owner in the summer of 1932, accidentally struck a rich deposit of uranus-mica formations, from which radium is usually extracted.

An analysis made by the discoverer later showed that the rocks in that region contains 62 per cent of uranium, 15 per cent of phosphorus acid, 6 per cent of lime, and 15 per cent of compound water.

The Belgian Congo is at present the only known source of radium in the world, producing some 99 per cent of the world's total. In the light of the fact that radium costs approximately Y.250,000 per momme (0.1325 of an ounce) one can readily appreciate the significance of the discovery of this rare element in Japan.

Uranium, the container of radium, is in itself a rare element. Ages of exposure are said to bring about an atomic change, creating radium, which fact was substantiated bn Madame Curie who discovered the metal in 1898.

" The location of the vein will have a very far reaching effect upon Japan's chemical and medical science," declared Dr. Taka. " Heretofore we have depended entirely on importation, whereas from now on we may be able to export. Having retired from the first line of scientific activities, I deliberately refrained from announcing my discovery on the assumption that some younger scientists might find it. No one has done so, which is why I now propose to announce it."

Motor Tricars in Rangoon

If the proposal made by Messrs. The Trading Company, late Hegt and Co., Ltd., to the Commissioner of Police, Rangoon, to introduce a new public service of conveyance meets with approval, Rangoon will shortly see a fleet of motor tricars or tricycles plying in the city.

It is the intention of the above enterprise to run a public service of the now familiar " Flytax" motor tricar. The tricars or " motor tricycles " will have a meter attached as in the case of taxis. The fare charged will be small, probably 3 annas per mile or part of a mile, and a waiting charge of the same amount for every quarter of an hour the tricar is engaged or 12 annas per hour.

Such a service is considered suitable for Rangoon, and the Police authorities view the proposal with favor.

The Burma Motor Association, however, is being consulted in the matter, and every hope is entertained that the Association will set the seal of their approval to the scheme.

Accommodation on the " Flytaxi" is limited to two passengers exclusive of the driver.

Manchurian Oil Fields Boom

(Continued from page 18)

secondary extraction process by superheat steam then follows. The extracted oil then goes through a refining process in cylinders. The daily output of crude oil will be around 400 tons from next April.

A bottled sample of shale in the office of the oil distillation plant was analyzed as containing 17 per cent of volatile matter including six per cent of oil, and 83 per cent of ash. It is the ash, the refuse matter from the oil distillation that will be used as the base material for the new cement factory at Fushun. The new import tariff on cement will aid the factory.

The combined coal and shale mines of Fushun are proving in this intensely industrial era the largest and richest treasure trove of Manchuria.

The Hupeh Highways, Waterways and Long Distance Telephones

By VAN YEH LEE, Commissioner of Bureau of Reconstruction

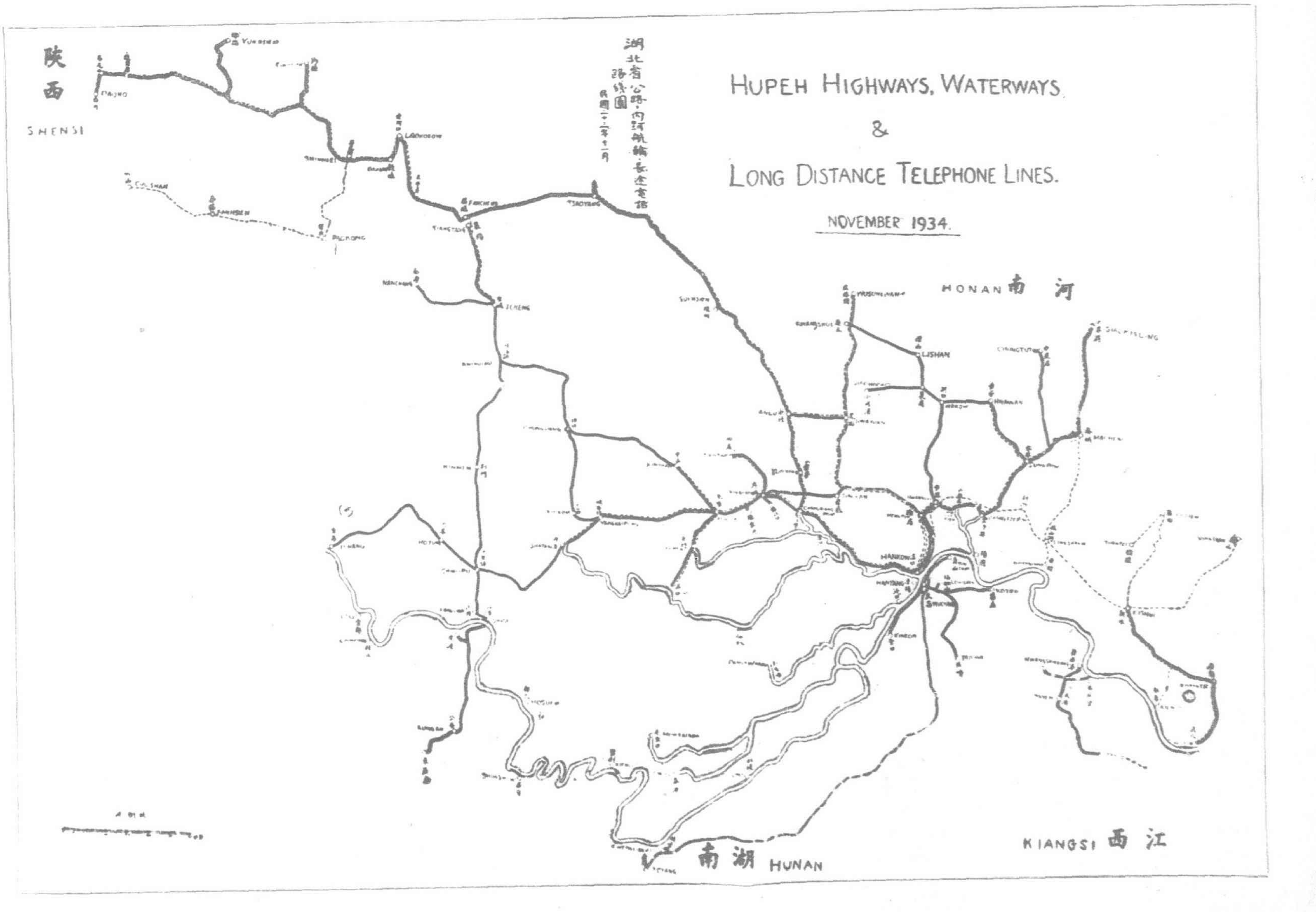
THE Province of Hupeh situated in the middle section of the Yangtze River, and is run through by two trunk railways from Peiping and Canton, and also at the intersection of two airways, Shanghai-Chengtu and Peiping-Canton. With these facilities of domestic transportation, the Hupeh commerce, industry and agriculture should be well developed, and interior communications should not be neglected to feed the main lines.

The Bureau of Reconstruction of the Provincial Government undertakes the administration of three important means of interior communications, that is, highways, inland waterways, and long distance telephones. Information as to the present conditions of traffic in these three branches is frequently enquired for, and a concise synopsis will be useful for the general public.

A. Highways

The highway lines at present open to traffic with daily bus schedules, are enumerated as follows:

1.—Hankow to Macheng Siaokialing, through Sungfow, Huangpei	181 km.
2.—Wuchang to Kotien	32 ,,
3.—Tayeh to Yangsin	28 ,,
(The above three lines are sections of the Kaifeng-Canton trunk line as projected by the National Economical Council).	
4.—Kwangtsi to Kishui	56 km.
5.—Hankow to Ichang, through Changkiangfow, Yingcheng, Tsaoze, Sayang, Shihlipu, Tangyang	360 ,,
(The above two lines are sections of the Nanking-Szechuen trunk line as projected by the National Economical Council).	
6.—Laohokow to Shasi, through Fangcheng, Siangyang, Icheng, Kinmen, Kienyang, Kiangling	281 ,,
7.—Shasi to Kungan	79 ,,
(The above two lines are sections of the Loyang-Shaochow trunk line as projected by the National Economical Council).	
8.—Fancheng to Hwayuan, through Tsaoyang, Suihsien, Anlu	333 ,,
9.—Laohokow to Paoho, through Kucheng, Tsaotan, Kunhsien, Juyei, Yunhsien	—
10.—Icheng to Nanchang, through Wuan	51 ,,
11.—Anlu to Changkiangfow, through Yungmeng	52 ,,
12.—Chungsiang to Yokow, through Kingshan, Tsaochih, Tienmen	190 ,,
13.—Kwangshui to Hwangpei, through Lishan	116 ,,
14.—Sungfow to Hwayuan, through Hwangan	150 ,,
15.—Chungkwanyi to Chungtutien	45 ,,
16.—Kwangtsi to Wusueh	36 ,,
17.—Yangkaifung to Kuihuipu, through Kiukow, Chunghsiang and Fongloho	140 ,,



18.—Tayeh to Hwangshihkiang	35 km.
19.—Yingcheng to Siaokan, through Yunmeng	80 ,,
20.—Yingcheng to Tientan	23 ,,
21.—Yingcheng to Chenkiaho	18 ,,
22.—Yingcheng to Lingkiangkow	10 ,,
23.—Wuchang to Tsingshan	18 ,,
24.—Wuchang to Kiangkow	35 ,,
25.—Wuchang to Lokishan (East Lake)	16 ,,
26.—Wuchang to Peichui	58 ,,

(The above 18 lines are branch lines as projected by the National Economical Council, or secondary lines).

The total length of roads open to traffic at present as listed above is 2,695 km., and the average daily mileage run by regular buses are about 6,000 km. A fleet of 193 buses and trucks are now operating on these roads including:

8 Bedford	96 Ford
49 Chevrolet	8 G. M. C.
30 Dodge	2 Whippet

An auto repair shop has been erected at Hankow for the maintenance of these engines, bodies being built in our shops also. About 20,000 to 25,000 gallons of gasoline is required to operate these buses every month. Passenger tariffs are calculated on the basis of from one cent per kilometer distance, up to two cents, depending upon local traffic conditions. Several new roads are under construction now, and before the end of the year, Tayeh will be connected to Wuchang, to enable through motor traffic to Nanchang, Kiangsi.

B. Waterways

Since last March, the Hupeh inland waterways steamers have all been put under the Government control and management, with a view to improving the service, insuring safety, and encouraging the movement of passengers and goods. Private owners of the steamers are guaranteed eight per cent interest per annum on the assessed value of the vessels; and by the end of last June, they were paid, besides the eight per cent as guaranteed, another eight per cent bonus and 10 per cent depreciation in cash. This means that the Government control system works on a financially sound basis, although the tariffs have been curtailed to a great extent as compared with those of the former private companies.

There are at present 57 steamers and 19 motor vessels controlled by the Government. Although most of these vessels are less than 30 meters in length, and are of wooden construction services are maintained on 21 lines up and down the Yangtze and the Han River, and their tributaries, with daily schedules. Over one hundred cities and towns are reached by these vessels, and over 6,000 passengers are transported every day. Statistics show increases of revenue month by month, for instance, roughly $69,000 in July, $84,000 in August, $102,000 in September, and $108,000 in October.

The different lines radiate from Hankow as follows:

1.—Hankow to Wusueh	214 km.
2.—Hankow to Changtsepu	65 ,,
3.—Hankow to Lohtsetien	63 ,,
4.—Hankow to Shasi	519 ,,
5.—Hankow to Chuho	193 ,,
6.—Hankow to Mowkiakow	240 ,,
7.—Hankow to Pangkiachang	135 ,,
8.—Hankow to Shayang	297 ,,
9.—Hankow to Changkiangpu	111 ,,
10.—Hankow to Tienmen	183 ,,
11.—Shasi to Ichang	137 ,,

Future development of the inland water communications will be aimed at building shallow draught vessels for the lakes and small streams, conservancy of waterways, through billing of cargo for exports, and the general improvement of equipments on board, wharves and godowns.

These vessels are periodically overhauled and repaired in our own machine shops in Wuchang, with 15 machine tools including lathes, planers, drilling machines, milling machine, etc., and also a brass foundry, a pattern shop, a forge shop, and a carpenters' shop. A slipway will be constructed in Wuchang, as we do not have dock facilities here.

The Hankow-Wuchang-Hanyang ferry service is another public utility that is having financial success. These are five lines between these three cities, with 12 landing places, and 15 steamers running on scheduled time from 6 o'clock in the morning to 12 in the night. They carry 50,000 passengers across the river every day, to accumulate for the monthly revenue, $40,000 the charge being less than three cents each trip. Two new ferry steamers have recently been ordered, costing $120,000, to be paid out from the profits of its own service.

C. Long Distance Telephone

The long distance lines go mostly side by side with the highways, and traffic has been inaugurated to the public at very low rates. 2,520 km. of double-wire circuit, with No. 12 S.W.G. copper wire, are now spread over the eastern, western, and northern part of the province, while in the southern districts, poles and lines were once installed, but taken by bandits some three years ago. These districts are scheduled to be reconnected in the near future.

Machinery and materials were purchased in 1928-9 from the Siemens China Co., China Electric Co., Kellogg Co., etc., totalling over a million dollars, besides poles and labor for erection. We have now one 50-line exchange, 17 10-line exchanges, 31 5-line exchanges, and 106 telephone sets. A list of the exchanges is given below, with central exchange in Hankow:—

Hwayuan, Anlu, Wusunkwan, Hengtien, Sinkow, Wusueh, Hwangpei, Changkiangfow, Suihsien, Kwangtsi, Changtsefow, Yingcheng, Tsaoyang, Kisui, Sungfow, Tsaoze, Fencheng, Yingshan, Macheng, Shayang, Siaokan, Lotien, Hwangtukan, Kwangsui, Tuanpei, Foutenho, Tuanfeng, Lohokow, Yunmeng, Kucheng, Yunhsien, Kunhsien, Paoho, Paokong, Fanhsien, Chushan, Shihwaka, Icheng, Tsoho, Lingshanho. Sinchow, Siaokialing, Hwangan, Yokow, Tienmen, Yangkaifung, Tangshu, Sungho, Tientien, Juyeh and Tsotien.

As the city telephone services are not well developed in Hupeh, only three city exchanges operating now, namely, Wuan, Shasi and Ichang, we cannot expect great financial success from the long distance service. But it proves an efficient instrument for military purposes. It also serves well some small towns having no telegraphic facilities, as written words can be transmitted by telephone in code just as by telegraph, and sent to the addresses.

The above mileage of the long distance lines and location of exchanges, do not include those of rural telephone services operated by various district governments, which are not connected with Hankow or Wuchang.

Electricity for Japanese Aluminium Manufacture

Expansion in the aluminium manufacturing industry, resulting from the prospective completion of the Jitsugetsutan power station of the Taiwan Electric Power Co. is making headway. From a total of 100,000 kilowatts to be generated, the company will supply one-half to the aluminium industry and the other half to other industries. Big business concerns, such as the Mitsui, Mitsubishi, Sumitomo, Furukawa, Yasuda and Kawasaki interests, plan to undertake the manufacture of aluminium.

An aluminium company with a capital of Y.10,000,000 is expected to be incorporated in Tokyo, with a yearly output estimated at 6,000 metric tons. Bauxite will be used and imports brought from Sumatra. The 6,000 ton volume is nearly one-half Japan's total demand. The Electric Industry concern, which opened an aluminium factory at Omachi, the first of the kind in Japan, in December last year, has been producing only two or three tons, in spite of its daily capacity of eight tons. The company buys electrode carbon from the Showa Fertilizer Co., but it is not powerful enough to produce the required amount of aluminium. Thus Japan Electric Industry intends to complete a new electrode factory capable of producing 20,000 metric tons annually. The Nichiman Aluminium Co., incorporated in September, 1933, plans to manufacture yearly 3,000 metric tons of aluminium and later to increase this to 12,000 tons. Its factory is in course of construction and operations may begin next fall. Practically all aluminium now on the market is made from bauxite. Nichiman, however, will use alums obtained in Korea and Manchuria as raw material.—*Eastern Engineering and Commerce.*

Amanogawa Power Plant

THE Amanogawa electric power plant which supplies the entire electric power throughout the Kwantung Leased Territory with its 12,000 kilowatt power by the four turbine generators, two of which are now kept in reserve, was constructed in 1922 at a total cost of several million yen, after the South Manchuria Electricity Company found it necessary to enlarge the old power house within the city proper, located towards the railway yard near the water front.

" The unique feature of the plant is the absence of the black heavy smoke rising from the chimneys which is characteristic of all large coal burning plants. But here the combustion is so complete that the only noticeable smoke is the light almost transparent stream of smoke which gives little trouble to the neighboring inhabitants.

" The complete combustion is solely due to the fine pulverized coal dust that is fed to the boilers where it gives almost perfect combustion. The large steel pipe rising from the ground to the roof on the side of the building conveys ordinary coal to the pulverizer within the plant at the rate of 100 tons per hour. At the top of the bucket conveyor there is an automatic weigher testing the coal load, every ton, and drops it, after weighing, into two large coal bunkers capable of holding 150 tons each. From the coal bunkers the coal then goes into a container through a belt conveyor, from which the coal is drained into three driers, one foreign and two local made, each capable of drying 15 tons per hour.

Three Pulverizers

" As soon as the coal is dried with the driers it is discharged through the screw conveyor into what is called the mill bunker holding 35 tons, from which the dried coal passes into three different pulverizers, two of which are of foreign made and one of local design, which we call here the ball mill. Each of these mills has 16 tons of steel balls, varying from 33.5 millimeters to 63.5 millimeters. Each pulverizer is capable of powdering 10 tons of coal per hour or 30 tons of coal each hour of the day.

" When the coal is thus powdered into dust it is then blown into a sieve by means of a mill ventilating fan, where the unground coal is obstructed and returns to the pulverizer by another route. The powdered coal dust then goes into a container termed the cyclone separator to blow apart the possible hardening of the dust for better employment in combustion. From the cyclone separator the coal dust is conveyed into the final container called the dust bunker through the screw conveyor, when it is blown into the boiler for combustion by the primary air fan. So much for the pulverizing system," the young engineer concluded in explaining the entire process of the coal consumption at the power house. The total coal consumed by the power house is said to be 250 tons daily for producing 380,000 kilowatt per hour of power.

Boiler Room

The young engineer then conducted his visitor to the boiler room which he said was burning at the temperature of 1,500 centigrade, and in which were quite a number of tubes and pipes for the production of the steam power. The boiler room, implying a boiling hot temperature, was in reality rather a comfortable place, in which the engineer said that all the heat was conserved within the boiler and not wasted outside.

The next room was the steam turbine generating room where four enormous generators are systematically erected at a fixed distance ; the first being the American product of Westinghouse make which is capable of generating 5,000 kilowatts of power to light 50,000 bulbs of 100 watt each. This was purchased in 1922 at a cost of Y.170,000. The one lying next to the American make is the Swedish generator by the famous Stal works, bought in 1924 at Y.196,000. This generator is capable of producing 7,000 kilowatt with power to light 70,000 bulbs of 100 watt.

Reserve Generators

The BBC (Brown Boveri Company) of Switzerland stands next which was brought into the present station in 1930 at a cost of Y.372,000. This is equipped with 15,000 kilowatt power. The last of the four giant generators is of Mitsubishi make having the same power and capacity as that of the BBC, was installed in 1931 at a cost of approximately Y.300,000. The two former ones are now being kept as spare or reserve and the latter two are kept running to furnish the entire electric power of the Kwantung Leased Territory.

The next place the visitor was taken was the switch room where hundreds of switches were installed together with innumerable transmitting boards and buttons for various purposes. These are said to be manufactured in Japan.

The electric current after being produced in the generators passes through the switch room and to the outside or outdoor transmission or alternating station and to the city, Port Arthur, Chinchow and other places. The voltage of the current immediately leaving the home station is said to be 11,000, which is reduced according to the different usage as 3,300 for the ordinary high tensioned wires in the streets, 600 for the tramways, and 110 for the ordinary household uses.

What becomes of the steam used in running the turbine generators was pointed out in the everlasting spray of water across the river from the power house. The steam, after passing through the turbine is led to the pond to be cooled and to be taken into the boiler room again. Therefore the spraying-pool is called the cooling pond at the power house.

Four Departments

The entire power plant is now being run by a little over 100 men under the superintendent, Mr. Kiichi Oshima. The force is divided into four departments ; business, electric, operation, and works, each with its chief and assistant.

The working hours of the plant which keeps running 24 hours a day are divided into three shifts ; the first being from 11 p.m. to 8 a.m. of the following day, the second shift being from 8 a.m. to 4 p.m. and the third shift being from 4 p.m. to 11 p.m.

At the present time the higher officials of the Amanokawa power plant concurrently hold similar positions in the new power plant at Kanchingtzu.—*Manchuria Daily News.*

Communications in Manchuria

The Manchuria Telegraph and Telephone Company announces a plan to expand its communication system throughout Manchuria. The following are some of its projected enterprises :—

Dairen : As the Central Telephone Office at present handles only 20,000 telephones, another telephone office will be built at Fushimida (Dairen), at a cost of Y.600,000, which will be capable of handling 7,000 telephones. This will be completed by the end of this year.

Mukden : A thousand telephones will be added by next autumn. At present it costs Y.900 to instal a telephone in Mukden.

Changchun : A switch-board to handle 1,000 telephones is to be constructed.

Harbin : The number of telephones will be increased.

Tsitsihar and Kirin : New automatic telephones have been installed.

Peianchen : A new telephone station will be built.

Tumen : New telegraph and telephone stations are planned.

Chaoyang and Chihfeng : The number of telephones will be increased.

Chengteh (Jehol) : A new telephone office will be built.—*Reuter.*

Mining Activities and Prospects in China*

By HUANG CHIN-TAO, Director, Mining Department, Ministry of Industry

SINCE the establishment of the National Government, the urgent need for real unification of the country has been felt, and no efforts have been spared by the Government in achieving this end. Based on the experience of the past twenty years, it is the conviction of many leaders that unification established by political or military means is far less thorough and satisfactory than that reached by economic methods. The greatest task confronting the country to-day, therefore, is to encourage sound industrialization and economic reconstruction.

To make effective such a program, preliminary steps must be taken by according existing enterprises protection and encouragement, while the welfare of the people, especially the laboring class, must be properly taken care of. The abolition of exorbitant taxes, now being widely discussed, must be effected at an early date, while the commercial treaties concluded on an unequal basis must be revised. Many laws have been already promulgated effecting striking changes in Chinese industrial institutions. Among the more important are the Mining Law, Law for Encouragement of Special Industries, Law Governing Chambers of Commerce, Stock Exchange Law, Law Governing Amalgamated Industrial and Commercial Associations, Company Law, Labor Union Law, Law on Conciliation and Arbitration of Commercial Disputes, etc.

With a view to the early realization of national economic unification, the Ministry of Industry has drawn up a Four-year Industrial Plan, which includes the development of manufacturing and mining, agriculture and afforestation. In the first group are included eleven subdivisions—namely, coal, iron and steel, copper, petroleum, oil-shale (Shensi), acids, machinery, automobiles, sugar, paper and porcelain. The second division consists of seventeen subdivisions, of which eleven come under the head of agriculture, two represent fishing and stock-raising activities, and four relate to afforestation and land reclamation.

Development of Basic Industries

That the production of coal, iron and steel, petroleum, acids and machinery are "basic industries," is constantly in the minds of China's leaders. These enterprises are collectively known as the "mother of all industries," and are indispensable for national defence, for communications, and for the development of secondary industries. Immediate measures, therefore, are centered on the development of these basic industries.

China is a coal-producing country, yet imports annually more than two million tons, valued at over 20 million Haikuan taels. She is not poor in iron deposits, but is almost entirely dependent upon other countries for her iron and steel, the last figures showing an import of 9,868,077 piculs in quantity, and Hk. Tls. 54,987,616 in value. These facts not only reveal that the annual monetary drain to foreign countries is large, but also that China lacks one of the essential requirements of national existence under modern conditions. The urgent necessities of the situation demand that more vigorous and immediate steps be taken to remedy so unsatisfactory a state of affairs.

Mineral Resources

China possesses vast mineral resources, and even at the present time there must be many rich reserves still undiscovered. The Chinese began to develop mining industries by modern methods about thirty years ago, when some of the coal-mines were worked for the first time. A total of about 27,000,000 tons of coal is being annually produced. Nearly all the big iron-ore deposits of the country are being operated, although the business of iron and steel manufacture has not been at all successful. Tungsten and antimony ores are such special reserves that China could easily control the world market.

As reliable statistics relating to mines in the country are often difficult to obtain, it has been the work of the Ministry of Industry to conduct a series of investigations into the mining resources of the country. For some years past the Ministry has spent much time and effort in these investigations ; and the National Geological Survey has also done a great deal in the same direction, but more detailed information about the mineral resources of different provinces (including those on the frontier), is required in order to develop our mining industries.

The following information is condensed from reliable and extensive records so far collected concerning the mineral resources of the country, and will clearly show that the development of Chinese mining industries is a rather attractive field for investment of both domestic and foreign capital. Due protection to foreign interests is provided by the National Government, so that there need be no doubts on the question of security.

Deposits of Iron Ore

Iron ore is found practically in every province in China, and the following are the more important reserves :—

KIANGSU—in Fenghuangshan, Kiangning Hsien ; and Likuoyih, Tungshan Hsien ; a total reserve of 39,000,000 tons.

CHEKIANG—in Lichiakang, Changhsing Hsien ; Chienteh and Shunan, a total reserve of 7,000,000 tons.

ANHWEI—in Tungkuanshan, Tungling Hsien ; Taochung Fanchang Hsien, Tawashan and Nanshan Tangtu Hsien ; a total of 20,000,000 tons.

SHANTUNG—in Chinlingchen, Itu Hsien ; and Fei Hsien a total of 20,000,000 tons.

HOPEI—in Luan Hsien, with a reserve of 30,000,000 tons.

HONAN—in Hungshan, Wuan Hsien, Fenghuangshan, Hsiuwu Hsien and Hsinyang Hsien, a total reserve of 2,000,000 tons.

HUPEH—in Hsiangpishan Tiehmankan and Yehchiping, Tayeh Hsien, and Linghsiang, Hsishan and Leishan. O-cheng Hsien, a total reserve of 40,000,000 tons.

LIAONING—in Miaoerkou, Penchi Hsien ; Kungchangling and Anshan of Liaoyang Hsien ; a total reserve of 7,000,000,000 tons.

CHAHAR—in Lungkuan and Suanhua a total of 90,000,000 tons.

JEHOL—in Luanping and Lunghua a total of 10,000,000 tons.

KIANGSI—in Kiukiang, Juichang, Yunghsin Pinghsiang, etc. a total of 18,000,000 tons.

FUKIEN—in Anchi, Putien, Chienou, etc., a total of 5,000,000 tons.

Gold Ore Reserve

Gold bearing ores are divided into vein gold and gold placers. The more important places of distribution are as follows :—

Gold veins have been located in Jehol, Hopei, Shantung, Liaoning, Kirin, Hunan, Szechuen and Sinkiang.

JEHOL—in Sanchakou, Weichang ; Laochienkou Lunghua ; Pataoho, Luanping ; Chinkouchang, Chaoyang ; Chengte, Chienping, Fuhsin, Chifeng, and other districts.

HOPEI—in Taoyuan, Miyun Hsien ; Yapachuang Hsiaohsiho, Shachinkou and Itsuyuan, Funing Hsien ; Tashan, Taichialing, and Wolungkang, Linyu Hsien ; Tsienan, Hsinglung Tsunhua Juifeng districts.

SHANTUNG—in Linglungshan, Chaoyuan Hsien ; Maoshan, Mouping Hsien ; Chiutien of Pingtu Hsien.

LIAONING—in Kounaitientsu, Chingchiakou, and Tanchow, Chingyuan Hsien ; Tamiaokou, Tunghua Hsien ; Wanpaokaitsu, Kuantien Hsien.

KIRIN—in Pokehsitsu, Yenchi Hsien.

HUNAN—in Huangchintung, Pingkiang Hsien ; Liulin Chawuchi, Yuanling Hsien ; Soshapo, Hsiaochiawan, Taoyuan Hsien ; Mopin, Huitung Hsien.

SZECHUEN—in Panlanshan, Suichingtun, Maokung Hsien ; Maha, Tsuku, Mienning Hsien ; Wali and Tienping Yenyuan Hsien.

Gold Placers

Gold placers have been located in Liaoning, Outer Mongolia, Heilungkiang, Kirin, Sinkiang, Kansu, Jehol and Szechuen.

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Liaoning—in Chaihopao, Tiehling Hsien, on the Liao River, Wantientsu Shimiaotsu, Wufenglou, on the Hun River: Sanmuchang, Kuantouyu, Hoshangkou, on the upper Taitsu River. Fengcheng, Ai-ho on the Amur River. Hailung and Hsiangluyingtsu, on the Sungari; and Tamiaoerkou, Tunghua Hsien.

Mongolia—in Tushiyehtuhan and Chechenhan.

Heilungkiang—in Chilahlin, Anaya Chichienho on the Ulkonar River; Yuchingkou, Moho; Kuanyinshan Tuluho; Kumarho on the Amur River; Wutungkiang on the Sungari River.

Kirin—in Ilan, on the Peony River; Hsinglungkou, Mishan Hsien; Liangsuichuantsu, Mohlin Hsien; Wuhulin, Ningan Hsien on the Wusuli River; Tungning, on the Suifen River; Potsaokou, Wangching Hsien; Fengmikou, Santaokou, Yenchi Hsien; Laolungkou, Hunchun Hsien, on the Tumen River; Chiapikou, Huatien Hsien, Toutaokou, Panshi Hsien, on the Sungari River.

Sinkiang—in Kuitunho, Wusu Hsien; Manaissuho, Suilai Hsien; Wutukou Chenhsi Hsien; Tien Hsien; Chemi Hsien; and Chitai Hsien.

Kansu—in Tunhuang, Chiuchuan, Kulang, Tatung, and Hsining Hsien.

Jehol—in Tiehchiaying, Fengning Hsien; Shitsuho, Tamiaoho, Chengte Hsien, Wakou Miyunhsiang, Pingchuan Hsien.

Szechuen—in Changla, Sungpan Hsien, Suichingtun, Maokung Hsien; Panlanshan, Yuehchun Hsien; Yakutaitsu, Mienning Hsien; Wali and Yenfang, Yenyuan Hsien.

Deposits of Silver, Lead and Zinc Ores

Hunan—in Suikoushan, Changning Hsien—lead and zinc; Kuanshan and Tuanshan, Linhsiang Hsien—lead; Tuicheling, Pin Hsien—lead; Chaikungtang, Yucheng Hsien—lead.

Hupeh—Haofeng, Suanen, Chitsun, and Yuansi Hsien—lead.

Chekiang—Kaowukeng, Chuki Hsien—zinc, Lungchushan, Linhai Hsien—zinc, Yungchia Hsien—lead and zinc; Yinkengtsun, Tangchi—lead; Yinshankang of Ning Hsien—silver.

Fukien—Ningte Hsien and Kuangtse Hsien—silver and lead: Shichushan, Minhou Hsien—silver; Chiloshan, Yungtai Hsien—lead.

Szechuen—Iwansui, Huili Hsien, lead and zinc.

Yunnan—Tungchuan Hsien—lead and silver; Loping Hsien—zinc.

Jehol—Lunghua, Luanping, Pingchuan Hsien, silver.

Liaoning—Huatungkou, Kaiping Hsien—lead; Laojenkou, Huanhua Hsien—lead and silver; Erpengtientsu, Huanjen Hsien—lead and zinc; Chingchengtsu, Fengcheng Hsien—lead.

Copper Deposits

Yunnan—Tungchuan, Lunan, Chiensui, Hsuanwei Paoshan, and Yungpei.

Szechuen—Penghsien, Tienchuan, Huili, Jungching and Yuehchun, Districts.

Kuichow—Weining, Pichieh, Suicheng, Tating.

Liaoning—Penchi, Huanjen Districts.

Kirin—Shitsuishan, Panshi Hsien; Tienpaoshan, and Laotoukou, Yenchi Hsien.

Other provinces where beds of copper ore have been found are Kansu, Sinkiang, Sikang, Kiangsu, Chekiang, Hopei, Honan, Shantung, Shansi, Shensi, Hupeh, Hunan and Fukien.

Manganese Ore

Hunan—Hsiangtan, Yuehyang, Changning, Laiyang Yunghsing, Yuhsien, Pinhsien and Yucheng.

Kiangsi—Loping.

Kuangtung—Chinhsien, Fangcheng, Loting, Paoan.

Kuangsi—Wuhsuan, Kuiping, Laipin, Maping.

Liaoning—Hsingcheng, Fengcheng.

Tin Deposits

Yunnan—Kochiu.

Hunan—Anyuan, Pinhsien; Hsianghualing, Linwu Hsien; Shangwupao, and Cheinshan, Kianghua Hsien.

Kuangtung—Tienpai, Kityang, Tzekin Hsien.

Kuangsi—Fuchuan, Hohsien, Chungshan, Hochih Nantan Districts.

Kiangsi—Tayu, Chungi Nankang Districts.

Antimony Ore

Hunan—Hsikuangshan, Hsinhua Hsien; Panchi, Iyang Hsien, Kantsuyuan, Anhua, Shaoyang, Yuanling, Hsinning, Tungan, Hsupu Districts.

Kuangtung—Chukiang, Lochang, Meihsien, Juyuan Districts.

Kuangsi—Fengi, Tienpao, Hochih, Nantan, Maping, Ining Districts.

Yunnan—Wenshan, Kuangnan, Ami, Pingi Districts.

Kuichow—Tungjen, Tatang, Hsinghua Districts.

Szechuen—Paohsing.

Mercury Deposits

Hunan—Houtsuping, Fenghuang Hsien.

Kuichow—Yunchangping and Tatungla, Tungjen; Shengchi, Tafatung and Yangwu, Pachai.

Szechuen—Lungmenchang and Chushachi, Yuang Hsien.

Tungsten and Molybdenum

Kiangsi—Tayu, Lungnan, Anyuan, Kanghsien, Huichang, Nankang, Shangyu Shuichuan, Chungi Hsien—Tungsten, Tayu; molybdenum.

Kuangtung—Wengyuan, Lochang, Waiyang, Paoan Kityang, Wuhua, Yanping, Tsukin Haifeng, Chungshan, Chihhsing, Hoyuan, Tungkwan, Tsunghua—Tungsten; Waiyang, Wengyuan, Chihhsing, Wuhua—Molybdenum.

Hunan—Tsuhsing, Linwu, Yucheng, Kuitung—Tungsten.

Fukien—Changlo, Hsiapu, Chienyang—Tungsten, Ningteh, Yungtai—Molybdenum.

Chekiang—Tsingtien—Molybdenum.

Hopei—Tsienan, Funing—Tungsten.

Nickel

Szechuen—Huili.

Cobalt

Yunnan—Hsuanwei, Lunan, Hsuntien, Chengkung, Chani Districts.

Fukien—Fuan Hsien.

Aluminium

Shantung—Tsupo Hsien.

Chekiang—Pingyang Hsien.

Fukien—Futing Hsien.

Anhwei—Lukiang Hsien.

Coal Fields

Shansi—Coal is distributed extensively in this province in enormous quantities, and the quality is excellent. This province may be considered the centre of the country's reserve. The more important coal districts are Yangchu, Chincheng, Shouyang, Pingting, Yuhsien, Fensi, Tatung, Taiyuan, Hsiao-i, total resources, 120,000,000,000 tons.

Shensi—Deposits are scattered over the north-west, west, and south-west of the province, amounting to 70,000,000,000 tons.

Shantung—The more important deposits are at Tsuchuan, Poshan Changchiu, Laiwu, Tsaochuang, Fenghsien, etc. amounting to 1,600,000,000 tons.

Hopei—The chief fields are Luanhsien, Chingching, Lincheng, Wanping, Fangshan Tsuhsien and Linyu. Deposits more than 3,000,000,000 tons.

Honan—Coal districts are Wu-an, Anyang, Hsiuwu, Tsiyuan, Yuhsien, Hsinan, Shenhsien, Tangyin, amounting to 6,600,000,000 tons.

Szechuen—Coal districts are Kiangpei, Hochuan, Chienwei, Hanyuan, Weiyuan, Penghsien, Pahsien a total of 9,800,000,000 tons.

Hunan—Hsianghsiang, Ninghsiang, Yunghsing, Laiyang, with a total of 4,000,000,000 tons.

Liaoning—Fushun, Penchi, Chinhsi, Heishan, Fuhsien, Hsi-an and Liaoyang a total of 1,800,000,000 tons.

Jehol—Chaoyang and Fuhsin 600,000,000 tons.

Kirin—Muling, Omu, Yenchi over 100,000,000 tons.

Kiangsi—Pinghsiang, Poyang, Loping, Chi-an 900,000,000 tons.

Sulphur Beds

Sulphur is found in practically every province, the most important being Hunan, Shansi, Shantung, Honan, Liaoning, and Szechuen.

Kaolin

Kiangsi—Fouliang, Hsingtsu, Loping, Yukan, Yukiang, Kuichi Linchuan, Pinghsiang, Kiukiang, Hengfeng and Poyang.

Anhwei—Chimen.

Kiangsu—Ihsing.

Hopei—Tsuhsien, Fengjun, Chingching.

Shantung—Tsuchuan, Poshan, Lini.

Liaoning—Penchi, Fuhsien, Liaoyang, Yentai.

Fukien—Tehua, Ningte.

Kuangtung—Chao-an, Nanhai.

Hunan—Liling.

Honan—Yuhsien.

Shansi—Pingting and Tatung.

Fluorspar

Fluorspar is found chiefly in Hsinchang, Chenghsien, Chuki, Iwu, Chinhua, Linan, Wui, Ninghai, Hsiangshan and Wuhsing, Chekiang. It is also found in Haicheng Kaiping, and Fuhsien, Liaoning, and Kiaochow, Shantung.

Talc and Soapstone

Both talc and soapstone are found in Liaoning, Hopei and Fukien.

Asbestos

Asbestos is plentiful in Szechuen, Sikang, Liaoning, Hopei, Jehol, Shansi, Shensi, Hupeh and Hunan.

Graphite

Graphite abounds in Suiyuan, Chahar, Kiangsu, Shansi, Honan, Hopei, Kiangsi, Hunan, Szechuen and Fukien.

Petroleum and Natural Gas

Shensi—East from Yenchuan, Yenchang, Ichuan, to Ansai. Fushih, Kanchuan, Lihsien in the west.

Szechuen—Fushun, Pengchi, Jenshou, Chienwei, Pahsien Tsuchung.

Liaoning—Anshan, Fushun, Penchi.

Kansu—Yumen Chilienshan.

Sinkiang—North of Talimu River.

Rock-salt and Potassium Salts

Rock salt and potassium salts are found in Szechuen, Yunnan, Kansu and Mongolia.

Gypsum

Gypsum is found principally in Yingcheng Hupeh, and Hsiangtan, Hunan. Other producing districts are Pinglu, Shansi; Chinhsien, Kuangtung; Hsiaohsien, Kiangsu; and Kuichi, Anhwei.

Natural Soda

Beds of soda are found in Inner Mongolia and Szechuen.

Phosphatic Rocks

Phosphatic rock is common in Kuangtung and Kiangsu.

Iodine

Iodine was discovered in mother liquor from brine in Szechuen last year.

Mining Concessions Granted

Up to the end of 1933 the mining concessions granted through the Department of Mines of the Ministry of Industry numbered no less than 1,384, with a total area of 13,513,182 *kung mou* (1 *kung mou*=100 square meters). The following is a classification of these concessions:—

	Concessions granted	*Kung mou*
Gold	46	457,713.44
Silver	7	23,059.35
Copper	5	10,584.70
Iron	55	439,030.85
Tin	43	113,847.99
Lead	32	131,612.92
Antimony	184	191,033.80
Zinc	7	32,872.47
Manganese	20	61,877.13
Tungsten	7	31,671.00
Molybdenum	3	5,243.74
Total	409	1,498,547.39
Coal	843	11,685,059.48
Rock salt	1	17,014.00
Gypsum	4	21,312.84
Barite	12	50,906.03
Arsenic	15	16,811.40
Sulphur	36	33,872.08
Fireclay	5	14,320.24
Talc	2	43,079.80
Asbestos	7	54,899.59
Kaolin	16	25,455.63
Mica	2	1,830.54
Fluorspar	22	12,621.98
Rock Crystal	1	14,778.31
Graphite	6	21,732.92
Marble	1	940.93
Total	973	12,014,634.87

In addition to the above, the Ministry of Industry hold the mining rights of some important concessions reserved for State operation, as follows:—

6	Iron ore concessions	in Anhwei
2	,, ,, ,,	in Kiangsu
1	,, ,, ,,	in Hupeh
1	,, ,, ,,	in Szechuen
6	Tungsten ore ,,	in Kiangsi
5	Coal ,,	in Hopei
1	,, ,,	in Kiangsi
3	Petroleum ,,	in Shensi
2	,, ,,	in Szechuen

There are already a number of Sino-foreign joint enterprises in China, such as the Kailan Mining Administration, the Pekin Syndicate, the Sino-British Mentoukou Coal Mining Co., the Chinhsing Coal Mines (a Sino-German enterprise), and the Luta Coal Mining Co. (a Sino-Japanese concern).

Steps are being taken to improve or reorganize collieries throughout the country; for owing partly to inefficient management, many Chinese collieries have either reduced output or suspended operations. With the various factors of coal production in China effectively adjusted, the country should soon be supplying all demands for this vital commodity.

Foreign Capital Invited

From the above statistics it is plain that China is not poor in mineral resources, on the contrary, she is potentially rich in this natural wealth. What is necessary for her people to do is to make use of resources which are still almost entirely hidden. In the execution of her program for industrial development China has repeatedly made it clear to the world that she welcomes technical and financial assistance from abroad. The employment of foreign capital in the development of domestic industries is included in the teachings of the late Dr. Sun Yat-sen, and the National Government is following the policy of securing enough foreign investment for the realization of its Four-Year Industrial Plan. The only condition is that foreign interests must abide by Chinese law; or, in the case of mining industries, undertakings must strictly observe the Mining Law. It is hoped that the information given in this article will arouse sufficient interest among our foreign friends to induce them to make further investments in Chinese industries.

Oil Reserves in China*

With its program of national industrialization definitely laid out, the Government is pushing on with vigor the starting of constructional work planned in many parts of the country, in spite of the many and serious difficulties it is facing in various directions. In the construction of highways suitable for motor traffic the Government has achieved a particularly good record during the past few years. Never before have there been so many miles of roads being built in all parts of the Republic at the same time. Not only are national highways being constructed by the Central Government, but local authorities are also doing invaluable work in this direction, many hundreds of miles being reported as completed from time to time, these roads joining important points within a province, or connecting market centers in neighboring provinces. The development of commercial aviation, too, has been rapid. Many routes are being already operated, and new lines are being planned. Provinces which are served with inadequate land or water communications can be reached in a very short time by air. It is generally agreed that, in order to bring about early realization of the plan for national industrialization, an efficient system of communications and transportation is absolutely necessary, and that a well-planned network of roads would greatly hasten that development.

Among the most important of modern sources of motive power is mineral oil, used in various ways for turning the wheels of many industries. The greatly increased mileage of motor highways, which is now proceeding at a fairly rapid pace, and the growing number and length of air lines, naturally cause a great increase in the consumption of gasoline. The development of industries and of transportation systems in recent years has resulted in a greatly augmented demand for mineral oil which cannot be supplied at home. During the last few years the import of petroleum and derivatives has exceeded $100,000,000 annually. The present industrial development indicates that the potential demand for these products is tremendous and an increased import almost certain, as local supplies are entirely inadequate, and what little can be so obtained is used mostly for illuminating purpose and, to a lesser extent, as a lubricant. The increased import of oil products will be seen from the following figures:

IMPORTS OF PETROLEUM AND DERIVATIVES, 1929/1933 KEROSENE

	American Gallons	*Haikuan Taels*
1929	239,263,293	55,177,498
1930	185,608,596	54,864,546
1931	171,140,380	64,549,371
1932	145,918,794	G.U.51,342,147
1933	187,261.165	G.U.44,799,828

LIQUID FUEL

	Tons	*Haikuan Taels*
1929	183,909†	4,023,415
1930	151,093†	3,877,252
1931	227,336	9,215.235
1932	234,660	G.U.8,197,365
1933	336,064	G.U.9,708,815

GASOLINE, NAPHTHA AND BENZINE

	American Gallons	*Haikuan Taels*
1929	28,644,358	9,144,198
1930	29,725,052	12,407,230
1931	29,754,655	14,672,574
1932	24,114,506	G.U.10,101,280
1933	31,281,601	G.U.10,937,703

Oil deposits have been found in many parts of China, and the oil-belt of the country may be roughly said to extend from northern Sinkiang, to Nanshan in Sinkiang, to Yumen in Kansu and Tunhuang in Szechuen, and from eastern Kansu to northern Shensi, crossing the Chinling range to the Szechuen Red Basin, surrounding half the Tibetan plateau. According to recent investigations, the deposits in Shensi, Szechuen, and Kansu are especially rich. Other places where oil deposits have been found include Jehol, Liaoning, and Shansi in the north, and Kuichow, Kuangtung, Kuangsi and Hunan in the south.

The deposit in western Kansu was reported to be very rich. A survey by the National Chi Nan University reveals that oil reserves from Yumen to Chiuchuan and Tunhuang are abundant. In some parts of Yumen the oil oozes out of the ground, and is used locally for illuminating purposes without refining. It is also used as a lubricant. The quality of the oil is excellent, containing 70 per cent kerosene and from 14 to 16 per cent gasoline, according to an analysis made by the provincial government. Although no estimate of the reserve has been made, the numerous seepages indicate that exploitation is worth while and is certain to be profitable.

The oil field in Kansu covers quite an extensive area, extending from Tunhuang on the west, eastward to Shantan. Seepages are found in Yumen and in places in the other district, and the following description of the Yumen deposit, contained in a report by the Chi Nan University, clearly reveals conditions:—

"The oil-wells in Yumen are located about 90 *li* south-east of Chihchinpao, and 190 *li* from the Yumen *hsien*. The oil deposit was discovered accidently by people engaged in gold-mining in the mountains. They found a black oil ozzing out from the rocks of the banks of the Shihyuho which they found suitable for illuminating purposes. It was once proposed by a Belgian prospector who visited the locality that the task of tapping the Yumen oil basin should be undertaken, but the plan was not approved by the provincial authorities, who subsequently took over the field and operated it as public property, people taking oil from the area paying a charge. About 41 wells are being operated by primitive methods, with only a few delivering oil of good quantity. During the winter the oil is frozen underneath the ground, and not until late in the spring does it begin to flow again. The supply is most plentiful during the summer months, and early in autumn begins to diminish. A large part of the oil discharged is carried away by the stream. There are no statistics regarding quantity of output, but it is estimated that about 50,000 catties of oil are obtained in a year.

"The oil is used by the natives only for lighting purposes, and in its crude form. The price within the Yumen district is only about $3 per 100 catties, but a tax of that amount is imposed on supplies shipped out of the district. Lubricating oil from these wells is used for the mule-carts which are the chief means of transportation in this area, and also in the Lanchow factory, woollen weaving mills, telegraph offices, etc., for lubricating, the product from Yumen being very much cheaper than imported oil, while the quality is good enough for the purpose.

"The oil is loaded on mule-carts and carried to Chihchinpao, whence it is shipped to various places. Yumen is quite an important point in Kansu province, about 1,600 *li* from Lanchow, the provincial capital, and 700 *li* from Hsinghsinghsia in the west, the latter point and Yumen being connected by an old military road which is negotiable by motor-trucks. The roads from Hsinghsinghsia to Hami and Tihua are in much better condition, and the two latter points are passed over by the Eurasian Aviation machines, with landing stations at Chiuchuan and Wuwei in Kansu. There are good prospects for the future development of communications and transportation in this area, and with the development of air and road systems, the oil industry will assume more importance."

In Szechuen petroleum and natural gas have been known of for centuries, but with the exception of the small quantity used locally for illumination and in salt-refining, no well of any considerable size has been drilled. According to the Szechuen provincial authorities, prospecting done with the aid of German experts shows that oil deposits are very rich within the provincial frontier. The field may be divided into four areas, namely, the Lioning-Fungan-Fungchi area, Tsechung-Jenshou area, Neikiang-Fushun-Luhsien area and Chungkiang area. Deposits are especially rich in the first and third areas.* Tsuliutsing and vicinity, lying north-east of Fushun, has been known as the most flourishing salt region of the country and the richest oil district of the province. The quantity of oil in reserve is not known, as no complete survey has been made, but judging by the output of wells operated by primitive methods, it is safe to say the deposits are rich. The Ministry of Industry is planning to exploit this area, and with the proximity of the oil area to the Yangtze River, between which are many smaller rivers, oil can be easily shipped to other parts of the country.

Chinese Economic Journal

†Not including Diesel and Solar oil

Recent investigation reveals that oil deposits in Shensi are extraordinarily rich, and according to an American expert who recently completed prospecting in this province for the Ministry of Industry, the supply from Yenchang *hsien* is sufficient to supply the world with oil for 300 years.

According to the Bureau of Reconstruction in the Shensi provincial Government, the oil-fields cover a very extensive area. Over thirty wells have been already found, scattered over the area north to Michih, Hsiahsien south to Tungkuan, Ichun *hsien*, west to Ans[illegible] and east to the bank of the Yellow River, corresponding to a length of about 700 *li* and width of over 200 *li*, or equal to about half the entire area of the province. The deposits in Fushih, Yenchuan, and Yenchang are especially rich.

For hundreds of years the natives in north Shensi had obtained lampblack for making ink-tablets and for medicinal purposes by gathering soot from burning oil, which is not suitable for illuminating purposes, and gives out a heavy black smoke. Toward the end of last century Yenchang oil was better known because of its more extensive use, and in 1882 a German firm, collaborating with Chinese, planned to start drilling at Yenchang, but such foreign enterprises not being allowed in the interior, the wells were taken over by the local authority and operated as a Government enterprise. The sum of Taels 200,000 was appropriated for the inauguration of the Yenchang Oil Bureau, a Japanese technician engaged, drilling-machines purchased from Japan, and the first well completed in August, 1907. The yield was about 100 catties per hour, and later increased to 400 or 500 catties. After being refined by a simple process, the oil was found very satisfactory, the amount of black smoke being greatly reduced and the light being very clean and bright, with the result that the use of this product as an illuminant was greatly popularized.

Upon expiration of the contract with the Japanese technician, another Taels 270,000 was appropriated for expansion of the project. New machines were bought to replace the old, which were not then in good working order. Another Japanese expert was engaged for prospecting work, who made a survey of the area in Yenchang and reported finding deposits in Huchaichun, Liaotsuyuan, Yenwukow, etc., in the *hsien* of Yenchang, but the result of sinking wells in accordance with his plan was not successful.

In 1915 the Standard Oil Company of New York, having obtained permission from the Chinese Government, conducted some prospecting operations in the oil-belt of Yenchang, but the result was not satisfactory, and the work was abandoned the following year, when the provincial authorities again exploited the field. Well No. 1 was operated during 1916-1917, the production averaging about 400,000 catties a year, but owing to unsettled conditions in the province and difficulties in communication and transportation, the enterprise was barely able to meet expenses. Well No. 2 was destroyed during some civil disturbances after 1920, and Well No. 1 was running low, its output being reduced greatly. For several years the wells were in a very bad condition, funds necessary for their improvement and expansion being unavailable. Several new wells were sunk during subsequent years, some being drilled by manual labor, but because of financial difficulties, the result was not very satisfactory. Drilling had to be suspended, on account of the inadequate equipment used, when a depth of over 610 feet was reached without oil being tapped. In those places where oil was struck, the yield was only small. The following table gives the quantity of oil obtained during the last six years from the Yenching wells, according to the Bureau of Reconstruction of the Shensi Provincial Government :—

	Catties
1927	111,000
1928	92,400
1929	270,448
1930	262,610
1931	132,510
1932	93,420

The failure of the enterprise to bring satisfactory results is due, according to an expert of the Bureau of Reconstruction of Shensi, to many causes. In the first place, the geological formation of Northern Shensi is simple, with very gentle folds, and therefore the oil-bed extends over a wide area. The concentration in one point of oil coming from an extensive bed is slow, and rest intervals are necessary to allow time for the oil to accumulate. Moreover, because of this geological formation, oil from a remote area has no time to drain into a distant area where the life of a well is short. The failure of the American oil company in tapping the area greatly discouraged investment in such enterprises, and lack of transportation facilities also had an adverse effect upon the industry, while the equipment purchased from Japan at the beginning of drilling operations was not new and did not last long. All these adverse conditions had the combined effect of leaving treasure underground which might otherwise have been used for the public benefit.

What should be done to-day, according to Mr. Chao Kuo-pin of the Shensi Provincial Government, is to start operations all over again, but in a small way. It is not necessary to sink a well beyond 600 feet, and better to have a greater number of more shallow wells. The Provincial Government is considering further exploitation of the oil field, and it is planned that a thorough geological survey will be first conducted, followed by prospecting work before any actual drilling is started. Next, good equipment must be purchased and consideration given to the improvement of by-products, transportation facilities, etc. Prices must be also reduced to meet the competition of imported products, for the industry was very hard hit by foreign oil, sold in the northern provinces at about one-third less than the Yenchang product.

The Ministry of Industry has in view a Four-Year Industrial Plan which includes the exploitation of oil-fields in Szechuen and Shensi, but it is necessary to construct highways for the transportation of oil products before any extensive development of the industry can be expected. At the beginning it would be too expensive to convey oil by pipes, and adequate water and land transportation must be provided. Tsuliutsing field is not far from, and is connected by waterways with, the Yangtze River, and thus the problem of transportation in Szechuen is easier to solve. The distance from Yenchang, in Northern Shensi, to Chichentan, on the northern bank of the Yellow River, is about 110 *li*, and a highway must be built to connect the wells with the river, which from this point is navigable by vessels carrying from 20,000 to 100,000 catties. The distance is about 700 *li*, ending at Tungkuan, where the Lung-Hai railway is available. Other important oil centers, such as Fushih, 150 *li* west of Yenchang, and Yenchuan 20 *li* north, should also be connected by roads. The highway between Yenchang and Fushih is in bad condition, and the old bed should be utilized for making a modern road.

In short, the steps to be taken should be (1) to conduct a geological survey to locate possible sites for wells, (2) to drill the sites chosen and (3) to raise and refine oil and extract by-products. The existing Yenchang wells were sunk without enough survey work being done beforehand, hence their failure. It is proposed during the first year that survey work be carried on both in Shensi and Szechuen ; the necessary machinery and equipment will be purchased and transported to the sites chosen during the second year ; during the third and fourth years about 500 borings will be made in the two provinces. The amount required for the project, including the construction of roads, sinking wells, buying machinery, etc., is estimated at about 11½ million dollars, and it is believed 80,000,000 gallons of oil could be obtained annually when the plan is in full operation, representing about one-quarter the amount of oil imported every year, and making a strong foundation for the further development of the oil industry in China.

The Central Government is considering taking part in this scheme jointly with the Shensi provincial authority. Five drilling-machines have been purchased, will arrive shortly, and be immediately sent to Yenchang. It is planned that 30 borings be made within the first two years, and it is hoped the Central Government will advance $150,000 as part of funds required for the project. After two years the enterprise would be handed back to the absolute control of the Shensi provincial authorities.

**China Press*, January 29, 1934

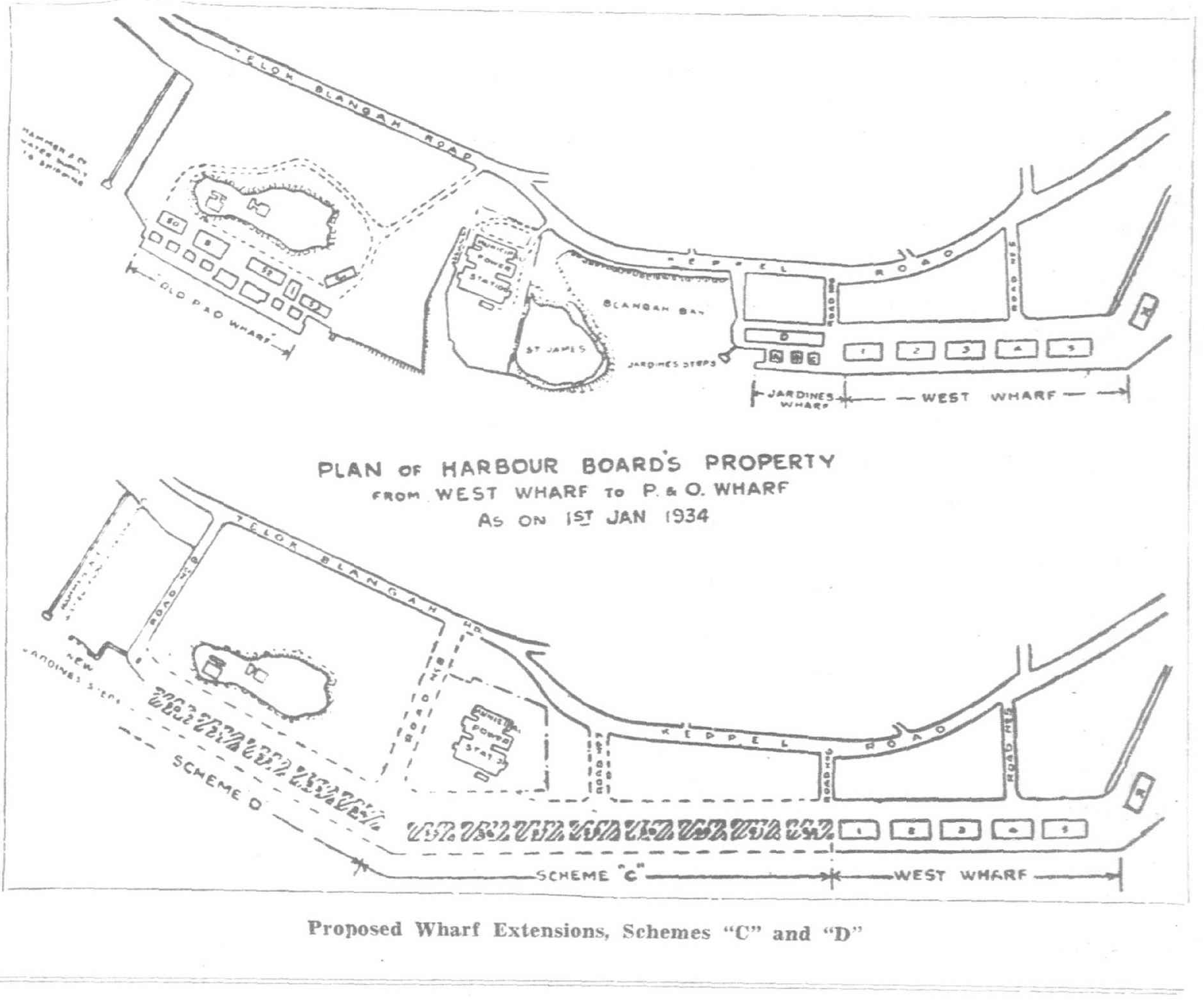
Singapore Harbor Extension Scheme*

MESSRS. Topham, Jones and Railton, Ltd., have been awarded a contract for wharf extension at Singapore, and it is anticipated that work will commence before the end of the year, and be completed by 1938.

The extensions provide for an addition of some 3,300 lineal feet of concrete blockwork wall, of similar construction to the existing wharf, carrying 33 feet of water at L.W.O.S.T., together with thirteen additional transit sheds of 200 feet by 100 feet in width. The scheme also provides for the dredging of a large portion of the meander shoal opposite section 10 to a depth of 33 feet below low water and giving a channel of some 800 feet width opposite section 10. The completion of the new wharves is the final step in a scheme of wharf development which was initiated in 1925 by the Singapore Harbor Board. The chairman, Mr. G. W. A. Trimmer, submitted a report to the Board, dated June 18, 1927, reviewing five schemes and expressing a strong preference for Schemes "C" and "D." Scheme "C" involved the demolition of Jardine's Wharf and its replacement by a blockwork construction wharf of a permanent type, extending from the existing godown No. 1 at West Wharf, past St. James' Generating Station. Scheme "D" involved the demolition of the P. & O. Wharf and its replacement by a blockwork construction wharf connected to the wharf proposed under Scheme "C." The two plans above, reproduced from the *Straits Times*, give a general idea of the harbor area as it is to-day, and as it will be on completion of the contract.

Messrs. Coode, Fitzmaurice, Wilson and Mitchell, London, consulting engineers, in a report dated April 19, 1928, supported Mr. Trimmer's views. The Imperial Shipping Committee also issued a report in May, 1929, after hearing evidence, and advised the adoption of Schemes "C" and "D." The Board forwarded a recommendation to Government to sanction the construction of Schemes "C" and "D," and the Government's general approval was received in February, 1931, but the Board decided to defer the extensions in view of the serious falling off in revenue and general trade of the port which, commencing in 1930, developed to such an extent that in the ensuing three years the Board were forced to retrench drastically. In spite of the depression, however, occasions arose during 1932 and 1933 when it was found impossible to accommodate all the vessels requiring berths. During his stay in England on home leave last year Mr. Trimmer had an interview at the Colonial Office, as a result of which the terms of the loan for the financing of Schemes "C" and "D" were settled. On Mr. Trimmer's return the Board decided that the time was ripe for calling for tenders. Six firms of constructors accepted the invitation to tender, and their representatives visited Singapore in May and June of this year. Tenders were submitted to the Crown Agents on July 19, and the Board's Consulting Engineers, Messrs. Coode, Wilson, Mitchell and Vaughan-Lee, and the Crown Agents, recommended the acceptance of the tender of Messrs. Topham, Jones and Railton, Ltd., who constructed the King's Graving Dock which was opened in 1913, and completed the construction of the Empire Dock in 1914, and the reconstruction of the Main and West wharves in 1918.

Messrs. Coode, Wilson, Mitchell and Vaughan-Lee, and Mr. G. W. A. Trimmer, will act as engineers-in-chief of the Board during the period of the contract. Thirteen godowns, similar to those on the Main Wharf, are to be constructed, four of which will be provided with extra large doors for handling aeroplanes and bulky packages.



Proposed Wharf Extensions, Schemes "C" and "D"

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*Eastern Engineering and Commerce.

Colombo Harbor Improvement

A scheme for the widening or duplicating the existing lake to Colombo Harbor canal locks is now being formulated by the Colombo Port Commission authorities in view of the growing popularity of this waterway and the anticipated increase of its present volume of traffic. The contemplated scheme, it is learnt, is estimated to cost about three lakhs of rupees. The scheme includes the provision of new sites for stores on the lake front by the reclamation of its swampy portions and the straightening out of other portions so as to render them suitable as building sites. It is understood that the authorities anticipate a big sudden demand on the lake front by commercial firms dealing in tea and rubber. One consequence of such a development would be that the lake to harbor lighter traffic would increase so much as to lead to serious congestion in the single canal, which now has direct connection with the harbor. Hence the necessity for either widening or duplicating the locks.—*Dock and Harbor Authority.*

Engineering Notes

INDUSTRIAL

AMMONIA PLANT FOR SHANGHAI.—The Pacific Ammonia Chemical Co. plant in Seattle is to be dismantled and moved to Shanghai. The plant was recently sold by the DuPont Powder Co.

CEMENT PLANT PROJECTED.—The Onoda Portland Cement Co., the second largest concern of its kind in Japan, proposes to build a new plant in North Kyushu not far from Moji, where the largest plant of the Asano Portland Cement Co. is located. Monthly production is estimated at 11,000 metric tons.

FLOOD PREVENTION IN CHINA.—An agreement for a loan of $200,000 from the British Boxer Indemnity Refund for repair of the dike in the Yellow River Valley has been formally signed at Nanking by representatives of the Board of Trustees of the British Boxer Indemnity Refund and the Yellow River Flood Relief Commission.

NEW MILL FOR KOREA.—Kanegafuchi Spinning Company has decided to erect a new mill in Koshu, South Zenra Province, Korea. Koshu is known as the cotton-raising centre of Korea. Construction expenses are estimated at Y.6,000,000. Work is expected to be completed within the year. The mill will be the largest in Korea, with some 50,000 spindles and employing 2,500 operatives.

ALUMINIUM FACTORY FOR JAPAN.—The Sumitomo Goshi Kaisha, Osaka, after experiments, has succeeded in producing aluminium not inferior to foreign products. It has therefore been decided to establish the Sumitomo Aluminium Refining Co., Ltd., capitalized at Y.10,000,000. Annual production is estimated at 1,500 tons. The plant will be at Niihama. The Sumitomo, Mitsui, Mitsubishi, Furukawa and two other large business interests in Japan plan to manufacture aluminium in Formosa, taking advantage of the completion of the Jitsugetsutan Power Station.

BREWERY FOR MANCHUOKUO.—Independent of the recent decision to found the Manchuria Beer Company under joint investment of the Japan Brewery Company and Kirin Beer Company and to erect a factory in Mukden, it is planned to establish in the near future the Great Manchuria Hops and Brewery Company in North Manchuria, to be capitalized at Y.10,000,000. The company, it is reported, will undertake the cultivation of hops and supply necessary quantities of it to all Japanese brewery companies. The proposed company will have five factories in Harbin and one each at Imiencheng and Mukden. The combined capacity of these plants is placed at 400,000 boxes a year.

COMMUNICATIONS

NAVAL RADIO IN JAPAN.—The Japanese Navy Office has decided to establish two radio stations, one at Maizuru and the other at Kisarazu, in the Chiba Prefecture.

LIGHTHOUSE TO BE REBUILT.—The Tokyo Ministry of Communications has set aside Y.19,000 to renovate the lighthouse on South Sanshantao Island at the entrance to Dairen Bay. The lighthouse was built by the Russians before the Russo-Japanese war of 1904-1905.

NONNI RIVER BRIDGE.—The Changchun Bureau of National Highways is to start the construction work on a new steel bridge, 89 meters long, seven meters wide and costing Y.1,500,000, across the Nonni River, near Tsitsihar. Work is expected to be completed in the latter part of June next year.

TELEPHONES IN CHINA.—An important order from the Chinese Government for hard-drawn copper wire for telephone development has been obtained by a Lancashire firm. The mileage of wire is more than 16,000, the total weight of copper being 1,700 tons. The firm is British Insulated Cables, Ltd., of Prescot.

TELEPHONE IN MANCHURIA.—A scheme for extending the present telephone service is to be undertaken by the Manchuria Telegraph and Telephone Co. Among other improvements, a new telephone exchange, costing Y.600,000, is to be built at Dairen. A thousand new telephones are to be installed in the Mukden district, and a new exchange to handle another 1,000 is to be built at Changchun.

MEMORIAL BRIDGE IN KIANGSI.—Work on the construction of the Chung Cheng iron bridge across the Kan River, between Nanchang and Niuhsing Station, on the Kiukiang-Nanchang Railway, was started on November 1. The bridge, which will be 1,080 meters long and 8 meters wide, will be named after General Chiang Kai-shek (Chiang Chung-cheng) in recognition of his meritorious services in the bandit-suppression campaign in Kiangsi. The total cost is estimated at $640,000, of which $200,000 will be provided by the Nanchang Provincial Headquarters of the Military Affairs Commission, and the remaining $440,000 by the Kiangsi Provincial Government.

ROADS IN CHINA.—The Chinese National Economic Commission is planning to build ten motor roads in Shensi, Kansu and Sinkiang provinces with a total distance of approximately 10,000 miles. Details of the scheme, which will cost the Government over $20,000,000, will be worked out after Mr. T. V. Soong's impending visit to the North-West. The ten projected lines and their approximate distances are as follows :—

	li
Sian-Eli Highway	6,500
Sian-Hanchung Highway	1,080
Paotou-Lanchow Highway	2,240
Lanchow-Suleh Highway	5,500
Paotou-Tachen Highway	6,045
Tachen-Suleh Highway	4,800
Hanchung-Paiho Highway	1,190
Hsining-Yuyu Highway	1,620
Sian-Paotou Highway	1,890
Lanchow-Hanchung Highway	1,300

ELECTRICITY

POWER FIRM PLANNED.—The Japan Electric Power Federation, consisting of five large concerns, is on the point of founding the Manchuria Electric Power Company under joint investment.

PROPOSED ELECTRIC TRAMWAY.—Wakamatsu Municipality intends to run an electric tramway in the city, and has applied to Tokyo for a loan for the purpose. The I.G.R. has decided to electrify the Funabaski-Chiba section of the Sobu Railway in 1935 at a cost of Y.3,500,000.

HONGKONG ELECTRIC PLANS.—Scrapping obsolete plant and replacing with the latest machinery, the Hongkong Electric Company anticipates heavy expenditure during the next year or two. It is also committed to the purchase of more land at North Point for storage purposes and possible station extension.

ELECTRICITY IN JAPAN.—The Toho Electric Power Company plans to increase its capital Y.70,000,000 to Y.200,000,000 to raise funds for building two water power generating stations and one steam power generating station. The matter will be submitted to its extraordinary general meeting of shareholders this month.

NANCHANG POWER PLANT.—Mr. T. L. Soong, manager of the China Development Finance Corporation, has concluded for his company a loan agreement with the Kiangsi Provincial Government to extend a loan of $1,700,000 to finance the construction of the water and power plant at Nanchang, it was revealed to-day. The loan is to bear interest of seven per cent to be redeemed in a period from five to 10 years, he disclosed. Mr. Soong is now in Nanking.

ELECTRICITY IN FORMOSA.—The Jitsugetsutan Generation Plant of the Taiwan Electric Power Co., Formosa, opened to operation on July 1. The station is capable of generating 100,000 kilowatts. Until the end of last month company's generating capacity was 45,000 kilowatts, of which water power totalled 23,000 kilowatts and steam power 22,000 kilowatts. It has been decided to supply 27,000 kilowatts to the proposed Taiwan Aluminium Industry Co., also to supply 10,000 kilowatts to the Kinkwaseki Gold Mine. The remainder of the power will be supplied to Formosan industry. Work on Jitsugetsutan Generation began 15 years ago.

CANTON ELECTRIC PLANT.—The Canton Municipal Government has signed a contract with Siemens China Company for a new electric power station with necessary equipment at a cost of $2,500,000 Hongkong currency. The new works will be installed by 1935 at Sai Chuen, on the western outskirts. Capable of supplying 30,000 kilowatts, this power station will supply electricity for use within Canton city, while electric power outside of Canton will be provided by the new hydro-electric plant to be erected at Yung Kiang, a tributary of the North River. Four years will be required to complete this generating station, the cost being $20,000,000 Hongkong currency. When completed, the station will supply electricity to a radius of 250 miles.

MINING

COAL LIQUEFACTION.—Hokkai Coal Liquefaction Company is to be founded in Hokkaido with a capital of Y.2,000,000. The promoters contemplate undertaking low-temperature coal distillation, and work is expected to begin next fall. The concern plans to produce 70,000 tons of crude oil from 100,000 tons of coal.

GOLD REFINERY SCHEME.—The Oriental Development Company, which purchased the Tosho Gold Mine in the North Zenra district of Korea last year for Y.200,000, is to erect a refinery there costing Y.100,000. Construction is expected to begin within the next few months. The company estimates an output of 85,680 grams of gold a year by disposing of ten tons of ores a day.

SILVER FOUND IN HOPEI.—Silver deposits extending over an area of 40 square *li* (over 10 sq. miles) have been discovered at Hungshankow, north-east of Tsunhua district in Hopei province. Mr. Shen Chung-yo, District Magistrate of Tsunhua, has telegraphed to the Hopei Provincial Department of Industry, reporting the discovery and suggesting that exploitation of the mine be offered to the highest bidder.

GOLD IN CHIENTAO.—Rich deposits of gold are reported to have been found in Chientao, on the Manchukuo-Korea border, by a survey party, headed by Prof. Kadokura, of Tokyo Imperial University, which has just returned to Japan. Prof. Kadokura declared that his party discovered a gold vein 12,000-ft. long, with thickness ranging from seven to 50-ft. and depth of about 7,000-ft., with gold contents reaching in spots the ratio of 369 to 1,000,000. He disclosed that in all about ten mines were discovered, but declined to give details.—*Rengo.*